Masterclock Product Catalog
2012-2013

Masterclock®

CE FC

Master Clock Overview

Multifunctional vs. Dedicated Master Clocks

A MULTI-FUNCTIONAL MASTER CLOCK (by Masterclock) is capable of generating, receiving and outputting multiple time signals for system-wide and cross-system time synchronization, utilizing the following protocols:

Inputs

- GPS
- NTP
- Time Code
  - IRIG-A
  - IRIG-B
  - IRIG-E
  - SMPTE
  - EBU
- NMEA
- Internal Oscillator

Outputs

- NTP
- Time Code
  - IRIG-A
  - IRIG-B
  - IRIG-E
  - SMPTE
  - EBU
- NMEA
- 10MHz Sine wave
- Programmable Pulse

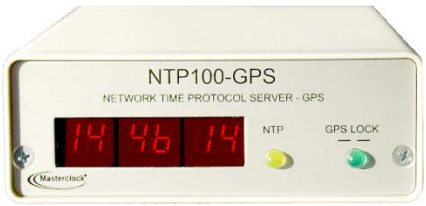
These units are modular and customizable. An example system could receive its primary time signal from GPS satellites and output dual signals to both your network (via NTP) and to your audio/video equipment (via Time Code). If the GPS receiver loses signal, our master clocks automatically switch to their internal oscillators, then back again whenever the GPS signal returns. All of this is contained in either one these devices.

MCR5000
1U rack mountable, maximum I/O options
Section 1.2

MCR1000
Compact
Section 1.1

A DEDICATED MASTER CLOCK (by Masterclock) generally inputs only one time signal and outputs only one time signal. For example, the TCO100 (below left) has an internal oscillator that generates the time and outputs Time Code. The NTP100-GPS (below center) receives its time signal from GPS satellites and it outputs NTP time. And the NTP100-TC (below right) receives Time Code and outputs NTP.

TCO100
Internal oscillator to time code
Section 2.7



NTP100-GPS
GPS to NTP
Section 2.1

NTP100-TC
Time code to NTP
Section 2.5

Multi-Functional Master Clock

MCR 1000

Reference Options

- GPS (atomic clock)
- NTP
- Time Code
- High Stability Oscillator
- NMEA 0183
- NENA 911 PSAP Standard

Output Options

- NTP
- Time Code
- Truetime/Kinemetrics
- NMEA 0183
- NENA 911 PSAP Standard
- PPO
- PPS
- 10MHz sine wave

The MCR1000 Master Clock Reference system is a compact, precision time and frequency device. One unit can reference and output NTP, Time Code and a 10 MHz sine wave all locked to the atomic clocks in GPS satellites. A high-stability crystal oscillator (OCXO) acts as an internal source of accurate time in case GPS signal is ever lost.

With specs equal or better than almost any other similar product, the MCR 1000 is up to 60% less expensive than its competition and available in multiple configurations to fit almost any need.

Rack mountable with an **RM4**

MODULAR FEATURES

Reference Sources

- GPS antenna/satellites
- NTP via Ethernet
- Various Time Codes: IRIG A, B and E, SMPTE, EBU
- Internal high-stability OCXO oscillator ± 0.25 min/year
- NMEA 0183 via RS-232 or USB
- NENA Format 0, 1 and 8 via RS-232 or USB

Outputs

- PC time set via USB serial
- NTP client via 10/100 Mb Ethernet
- Various Time Codes: IRIG A, B, and E, SMPTE, EBU
- NMEA 0183 via RS-232 or USB
- NENA Format 0, 1 and 8 via RS-232 or USB
- 5V at 20mA Pulse Per Second and Programmable Pulse Output
- 10MHz sine wave
- DB9 breakout adapter

Other Features

- Programmable relay closure.
  1 event per day with NO / NC dry contact relay,
  24V - AC/DC (250mA max)
- 6- or 9-digit display
- Optional relay scheduler for multiple events

Physical

Size:	6.75 x 4.13 x 1.5 in	**Weight:**	17.3 oz
	17.15 x 10.48 x 3.81 cm		490.5 g

Power

DC input - Threaded locking plug with external power adapter

Environmental Parameters

- Temperature: 0 to +60°C (0 to 40°C ±1 min/year)
- Humidity: Up to 90%, non-condensing

Masterclock, Inc.

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Master Clock Upgrades

MCR Modules and Add-In Options

STANDARD MCR FEATURES
Manual time set via network and USB
NENA In/Out (Format 0, 1 and 8)
NMEA 0183 In (ZDA, GGA, GLL, RMC)
NMEA 0183 Out (ZDA)
NTP Input client software
PPS
Relay programmable - 1 event
RS232 Port
TCXO oscillator ± 1 min/year
TELNET network setup software
Time/Date data output via USB
USB Port
Windows USB setup software
Windows network setup software

ADD-IN FEATURES	Modules and Add-ins							
(M) - Module, (F) - Firmware, (S) - Software	GPS (M)	TCR (M)	TCG (M)	HSO (M)	PPO (M)	LED Display (M)	Event Time (S)	NTP (F)
Catalog Page Number	1.3.1	1.3.2	1.3.3	1.3.5	1.3.6	1.3.7	1.3.7	
10 MHz Output Sine Wave				√A				
Atomic Clock Accuracy	√							
Day of Year and Time/Date Display						√*		
IRIG-A & E Generator			√A					
IRIG-A & E Reader		√A						
IRIG-B & SMPTE/EBU Time Code Generator			√					
IRIG-B & SMPTE/EBU Time Code Reader		√						
Additional NMEA 0183 Out (ZDA, GGA, GLL, GSA, GSV, RMC, VTG)	√							
NTP Time Server Function								√
OCXO Oscillator ± .25 Seconds/Year				√				
PPO - Programmable Pulse Output					√			
Relay Programmable – Multiple Event							√	
Time Code Format Translation		√	√					
Time/Date Display						√*		

LEGEND
√ Module/Add-in provides selected feature.
√A Advanced version of option provides selected feature.
√* Different options are available for MCR1000 and MCR5000.

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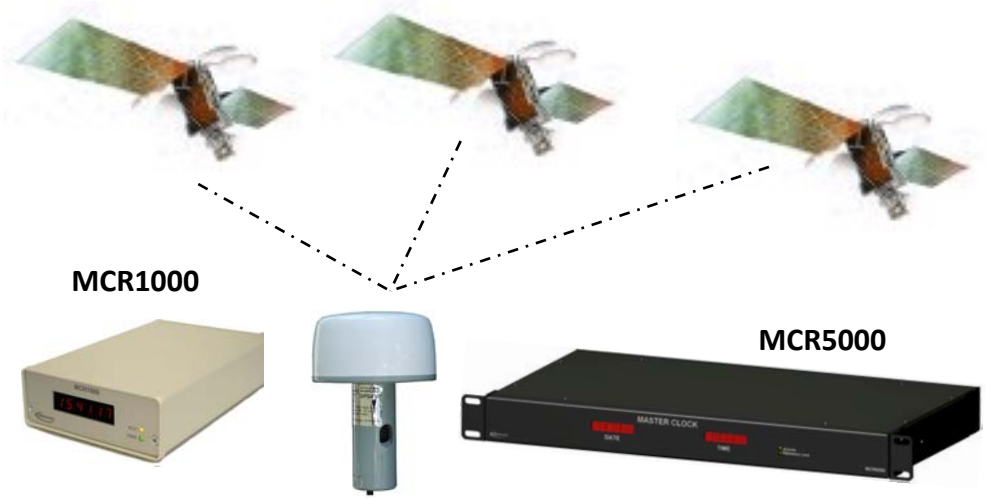
Master Clock Upgrades

MCR-GPS Module Option

Key Features

- Add to **MCR1000** or **MCR5000**
- Receives time signals from up to twelve GPS satellites
- Provides accurate reference to within ± 100 nS of UTC
- Optional **NMEA-0183** messages on serial port output
- Provides most accurate external time source for MCR
- Includes Standard Antenna
- Antenna cable lengths up to 500’ (152 m) available
- In-line surge arrestors and in-line GPS amplifiers available
- Compact design for portable applications

Masterclock’s **MCR-GPS** (**GPS Receiver**) is an add-in module option for the MCR100 and MCR5000 (both shown below). This inserted module provides a precision time reference based on GPS satellite broadcasts. The NMEA-0183 option is for marine applications. PPS on-time output is locked to the top of each second. **Order your MCR-GPS module when you order your MCR device.**



Specifications	MCR-GPS Module Receiver
Satellites	12-channel, up to 12 satellites simultaneously, parallel
Frequency	L1, 1575 MHz
Antenna Connector	SMA female
RF Bias to Antenna	3V DC, Center Pin
PPS	4 µs, TTL level, on-time leading edge
Accuracy	± 100 nS of UTC
	Standard Antenna
Type	Active, external
Gain	32 dB
Mount	Outdoor, threaded pipe/mast. M24 x 1.5 internal thread. Mounting kit provided.
Operating Temp	-40° to 85°C, (high humidity)
Voltage	3/5 VDC, center pin
Power Consumption	.24 W @ 22 mA
Polarization	Right hand circular
Weight	4.9 oz (*140 g*)
Impedance	50
Dimension	3.7” diameter x 4.9” length (*96mm x 126mm*)
Connector	SMA female
Antenna Cable	50’ (*15m*) Beldin 8219, 50 ohm low loss with SMA male connectors

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Master Clock Upgrades

MCR-TCR Module Options

Key Features

- Add to **MCR1000** or **MCR5000**
- Reads and synchronizes to SMPTE and IRIG Time Codes
- Software controlled
- Advanced TCR option available
- Autodetect and automatic gain control of incoming Time Code
- Optional interconnects with BNC9 female adapter, terminal block adapter (MCR1000) or BNC female, 3 POS terminal block (MCR5000)

Masterclock's **MCR-TCR (Time Code Reader)** is an add-in module option for master clock reference devices that reads and synchronizes to SMPTE or IRIG-B. An optional feature also reads IRIG-A and IRIG-E waveforms. The TCR option is software controlled and uses automatic gain control when it locks to the most accurate time reference available to the unit.

MCR1000 and MCR 5000 units may be ordered with this MCR-TCR option. Our affordable price and flexible order options make this unit popular in broadcast, industry, power distribution/monitoring and specialized military applications.

MCR1000 **MCR5000**

Specifications		Time Codes Read			Additional Time Codes w/Advanced TCR Option			
Format		**SMPTE 12M**	**IRIG-B DCLS**	**IRIG-B AM**	**IRIG-A DCLS**	**IRIG-A AM**	**IRIG-E DCLS**	**IRIG-E AM**
Rate		24,25, 30 fps NDF	1kHz, 1mS	1kHz, 1mS	10kHz, 0.1mS	10kHz, 0.1mS	100Hz, 10mS	100Hz, 10mS
Input Level Range		0.2 – 18Vpp 2 Vpp $_{nom}$	0.5 - 12 Vp 5Vpp $_{nom}$	0.5 – 8 Vpp 5 Vpp $_{nom}$	0.5 - 12 Vp 5Vp $_{nom}$	0.5 – 8 Vpp 5 Vpp $_{nom}$	0.5 - 12 Vp 5Vp $_{nom}$	0.5 – 8 Vpp 5 Vpp $_{nom}$
Input Impedance kΩ		>10 kΩ			>10 kΩ			
Mark to Space Ratio		NA	NA	3.3:1	NA	3.3:1	NA	3.3:1
Automatic Gain Adjust		Over input level range			Over input level range			
Number of Inputs SE: Single Ended – Unbalanced Differential – Balanced		1SE 1DIFF	1SE *1DIFF	1SE *1DIFF	1SE *1DIFF	1SE *1DIFF	1SE *1DIFF	1SE *1DIFF
Type		NDF	DCLS	AM 1kHz	DCLS	AM 10kHz	DCLS	AM 100Hz
ENCODING		None, Leitch Date, SMPTE 309M	None, IEEE 1344 year or IRIG STD 200-04		None or IEEE 1344 year or IRIG STD 200-04			
IRIG Coded Expression IRIG STD 200-04	**0 BCD_{TOY}, CF,SBS**	NA	B000	B120	A000	A130	E000	E110
	1 BCD_{TOY}, CF	NA	B001	B121	A001	A131	E001	E111
	2 BCD_{TOY}	NA	B002	B122	A002	A132	E002	E112
	3 BCD_{TOY},SBS	NA	B003	B123	A003	A133	E003	E113
	4 BCD_{TOY}, BCD_{Year}, CF, SBS (IEEE-1344 –1995 Encoding)	NA	B004	B124	A004	A134	E004	E114
	5 BCD_{TOY}, BCD_{Year}, CF	NA	B005	B125	A005	A135	E005	E115
	6 BCD_{TOY}, BCD_{Year},	NA	B006	B126	A006	A136	E006	E116
	7 BCD_{TOY}, BCD_{Year}, SBS	NA	B007	B127	A007	A137	E007	E117

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Master Clock Upgrades

MCR-TCG Module Option

Key Features

- Add to **MCR1000** or **MCR5000**
- Generates SMPTE and IRIG-B time codes, plus optional IRIG-A and -E
- Locks to GPS Receiver, Time Code Reader, NTP Client and HSO
- Optional Interconnects with BNC9 female adapter, Terminal Block adapter (MCR1000) BNC female, 3 POS Terminal Block (MCR5000)

Masterclock's **MCR-TCG** (**Time Code Generator**) is an add-in module option for master clock reference devices that generates SMPTE or IRIG-B time code signals. An optional feature also generates IRIG-A and IRIG-E waveforms. The TCG option is software controlled and locks to GPS satellites.

MCR1000 and MCR 5000 units may be ordered with this MCR-TCG option. Our affordable price and flexible order options make this unit popular in broadcast, industry, power distribution/monitoring and specialized military applications.

MCR1000

MCR5000

Specifications		Time Codes Generated			Additional Time Codes w/ Advanced TCG Option			
Format		**SMPTE 12M**	**IRIG-B DCLS**	**IRIG-B AM**	**IRIG-A DCLS**	**IRIG-A AM**	**IRIG-E DCLS**	**IRIG-E AM**
Rate		24,**25, 30 fps NDF**	1kHz, 1mS	1kHz, 1mS	10kHz, 0.1mS	10kHz, 0.1mS	100Hz, 10mS	100Hz, 10mS
Output Level @ 600Ω		4Vpp (5.2 dBm)	3 Vp (2.7 dBm)	4Vpp (5.2 dBm)	3 Vp (2.7 dBm)	4Vpp (5.2 dBm)	3 Vp (2.7dBm)	4Vpp (5.2 dBm)
Output Level @ 50 Ω		3Vpp (13.5dBm)	1.75Vp (8.8dBm)	3Vpp (13.5dBm)	1.75Vp (8.8dBm)	3Vpp (13.5dBm)	1.75Vp (8.8dBm)	3Vpp (13.5dBm)
Mark to Space Ratio		NA	NA	3.3:1	NA	3.3:1	NA	3.3:1
Gain		1	1	1	1	1	1	1
Number of Outputs SE: Single Ended - Unbalanced Differential- Balanced (*excludes model MCR1000)		1SE *1DIFF	1SE *1DIFF	1SE *1DIFF	1SE *1DIFF	1SE *1DIFF	1SE *1DIFF	1SE *1DIFF
Type		NDF	DCLS	AM 1kHz	DCLS	AM 10kHz	DCLS	AM 100Hz
ENCODING		None, Leitch Date, SMPTE 309M	None or IEEE 1344 year or IRIG STD 200-04		None or IEEE 1344 year or IRIG STD 200-04		None or IEEE 1344 year or IRIG STD 200-04	
IRIG Coded Expression IRIG STD 200-04	**0 BCD_{TOY}, CF,SBS**	NA	B000	B120	A000	A130	E000	E110
	1 BCD_{TOY}, CF	NA	B001	B121	A001	A131	E001	E111
	2 BCD_{TOY}	NA	B002	B122	A002	A132	E002	E112
	3 BCD_{TOY},SBS	NA	B003	B123	A003	A133	E003	E113
	4 BCD_{TOY}, BCD_{Year}, CF,SBS (IEEE-1344 –1995 Encoding)	NA	B004	B124	A004	A134	E004	E114
	5 BCD_{TOY}, BCD_{Year}, CF	NA	B005	B125	A005	A135	E005	E115
	6 BCD_{TOY}, BCD_{Year},	NA	B006	B126	A006	A136	E006	E116
	7 BCD_{TOY}, BCD_{Year}, SBS	NA	B007	B127	A007	A137	E007	E117

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Master Clock Upgrades

NMEA Input/Output Firmware Option

Key Features

- Add to **MCR1000** and **MCR5000**
- Reads, synchronizes to and outputs from NMEA-0183 ASCII messages
- Transmitted over RS-232, Ethernet and USB ports
- Software controlled
- Supports baud rates from 4,800 to 57,600

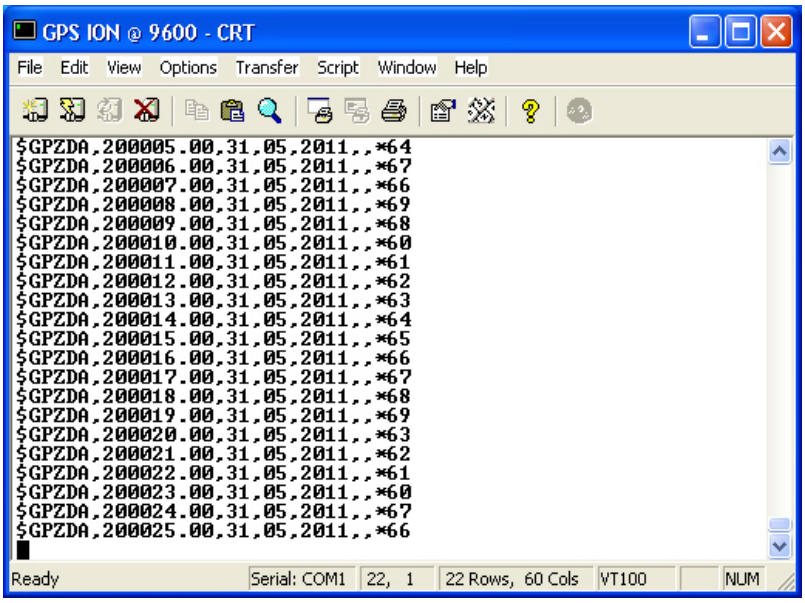
Masterclock's **MCR-NMEA** is an add-in firmware option for master clock reference devices that reads, synchronizes and outputs NMEA-0183 messages.

The NMEA input option automatically detects and locks to the incoming NMEA-0183 messages arriving from GPS satellites.

National Marine Electronics Association

NMEA-0183 →

Time and date ←



Specifications	Input/Output NMEA time stamped messages
Messages Supported	**ZDA, GGA*, GLL*, GSA*, GSV*, RMC*, VTG***
Baud Rates Supported	**4800**, 9600, 19200, 38400, 57600
Data Bits	**8**, 7
Parity	**None**, Odd, Even
Stop bits	**1**, 2
Decode Rate	Up to once per second per message
Accuracy	Within 10 ms of receipt of first character of NMEA packet. Overall accuracy to UTC top of second is dependent upon the NMEA output

*Requires MCR-GPS Module to output. **Default options are bold.**

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Master Clock Upgrades

MCR-HSO Module Options

Key Features

- Add to **MCR1000** or **MCR5000**
- Available in three precision grade levels (see chart)
- Typical holdover stability of 1 ppb/day, or better with OCXO
- Optional 10MHz frequency reference output
- Locks to most accurate time source (GPS Receiver, Time Code Reader, NTP Client)
- **Optional 10MHz reference output**

MCR1000

MCR5000

***MCR-HSO* Module**

Masterclock's MCR-HSO (High Stability Oscillator) is an add-in module for master clock reference devices. It provides precision time and frequency for a wide range of applications. Affordable price and flexible order options make this a popular add-in for meeting critical time keeping during holdover (loss of primary reference such as GPS), as well as for specialized applications requiring a precise frequency reference.

The HSO crystal oscillator (OCVCXO) maintains excellent holdover stability of up to 1 ms day. For time and frequency critical applications the rubidium atomic option can provide a time stability of better than 1 ms per year with frequency stability of up to $1x10^{-12}$.

When not tied to GPS, a precision frequency 10MHz reference output is available as a source for laboratory use or for an RF reference, including cellular applications. The MCR-HSO option is required for all 10 MHz signal outputs.

When locked to GPS, the OCXO 10 MHz sine wave frequency will have the same long-term stability as an atomic clock.

Freq = 10.000000 MHz		**1** Available in MCR-1000 and MCR-5000	**2** Available in MCR-1000 and MCR-5000	**COMING SOON** Available in MCR-5000 only
Oscillator Type		VCTXO	OCVCXO	Rubidium Atomic
Level (dBm) @ 50Ohms		7dBm ±2dBm	7dBm ±1dBm	7dBm ±1dBm
Freq Stability - Aging /day		TBD	(1x10E-9)	(4x10E-11)
Freq Stability - Aging/year		±1 ppm/year ($1x10E^{-6}$)	±0.3 ppm/year ($3x10E^{-7}$)	±0.0015 ppm/year ($1.5x10E^{-9}$)
Short Term Stability (Allan Variance) 1 sec gate		TBD	≤ 1.0 e^{-10}	≤ 5.0 e^{-11}
Time Drift per Year (max)		±3 sec	±.0.3 sec	±1.5 ms Note 1
Optional Outputs – (10 MHz Output Option)		1 **(clipped sine wave)**	1 **Sine wave**	1 **Sine wave**
Phase Noise (dBc/Hz) @ 10MHz	**1Hz**	NA	<-85dBc/Hz	<-65dBc/Hz
	10Hz	NA	<-115dBc/Hz	<-85dBc/Hz
	100Hz	NA	<-140dBc/Hz	<-112dBc/Hz
	1kHz	NA	<-150dBc/Hz	<-130dBc/Hz
	10kHz	NA	<-155dBc/Hz	<-140dBc/Hz

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Master Clock Upgrades

MCR-PPO Module Option

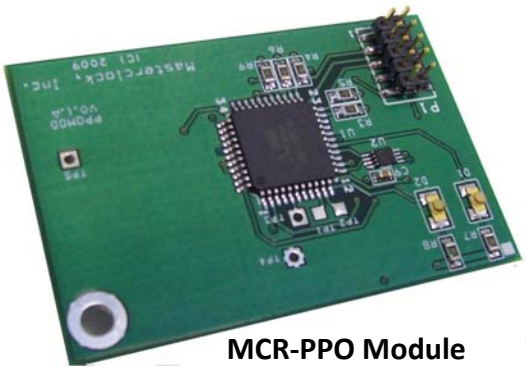
Key Features

- Add to **MCR1000** and **MCR5000**
- User programmable pulse width of .0001 to 214,747 seconds (2.4 days), with 100 µs resolution
- Edge triggered at top of second and synchronized to PPS
- One-shot, pulse train, or frequency generator modes with number of cycles up to 4 million
- Active high or active low pulse

Masterclock's **MCR-PPO** (**Programmable Pulse Output**) is an add-in module for master clock reference devices that provides a precision time referenced pulse output synchronized to the PPS of your master clock reference.

Pulse widths from 100 µs to over 2 days, with resolution of 50 µs, are achievable. You may set your pulse to be active high or active low, triggered from the top of each second. Pulses may be one shot, or you may use the PPO module to produce pulse trains or as a frequency generator.

Each MCR may be ordered with an MCR-PPO module option.



MCR-PPO Module

MCR1000

MCR5000

SPECIFICATIONS	Programmable Pulse Output Option
Modes	Frequency generator, one-shot pulse generator, pulse train (programmable cycles)
Frequency Range	4.657 e-6 Hz to 200 kHz
Pulse Width Range	.0001 seconds to 214,747 seconds
Resolution	100 µs
Programmable cycles	1 to 4,000,000 (0 cycles = continuous free running)
Accuracy	± 50 µs of PPS edge
Pulse Type	Active High or Active Low (5V at 20mA)
Trigger	MCR System PPS

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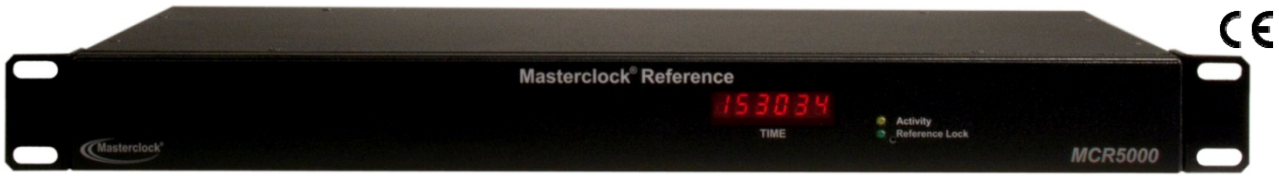
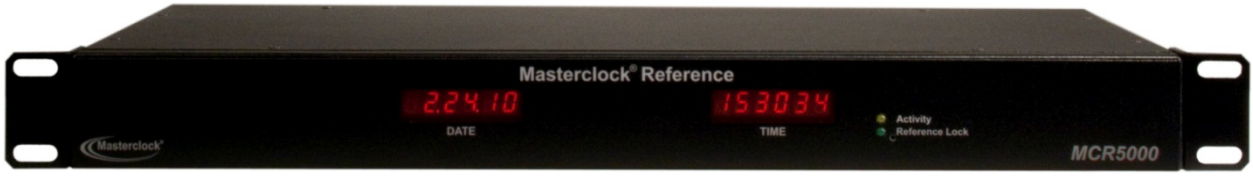
Multi-Functional Master Clock

MCR 5000



MCR5000 Display Modules

6 Digit (above) **12 Digit (below)**



Reference Options

- GPS • NTP • Time Code
- High Stability Oscillator
- NMEA 0183
- NENA 911 PSAP Standard

Output Options

- NTP • Time Code
- Truetime/Kinemetrics
- NMEA 0183
- NENA 911 PSAP Standard
- PPO (Programmable Pulse Output)
- PPS (Pulse Per Second)
- 10MHz sine wave

Precision Time and Frequency Reference System

The MCR5000 Master Clock Reference system is a 1RU rack mount, precision time and frequency device. It's larger than the MCR1000 and can handle more modules.

One compact unit can reference and output NTP and Time Code. It provides a 10-MHz sine wave locked to GPS satellites with a high stability crystal oscillator backup.

With specifications equal to or better than almost any other similar product, the MCR 5000 is available in multiple configurations to fit almost any need and is much less expensive than comparable products.

Reference Sources

- GPS Satellites
- NTP via Ethernet
- Time Code - IRIG A, B, and E, SMPTE, EBU
- High stability OCXO oscillator ±0.25 sec/year
- NMEA 0183 via RS-232 or USB
- NENA Format 0, 1, and 8 via RS-232 or USB

Outputs

- PC time set via USB
- NTP - client via 10/100 Mb Ethernet
- Time Code – IRIG A, B, and E, SMPTE, EBU
- NMEA 0183 via RS-232 or USB
- NENA Format 0, 1, and 8 via RS-232 or USB
- 5V at 20mA Pulse/Second & Programmable Pulse Output
- 10 MHz sine wave
- DB9 – breakout adapter

Other Features

- Programmable relay closure. 1 event per day with NO/NC dry contact relay, 24V - AC/DC (250mA max)
- Up to two 6-digit displays: time and date
- Optional relay scheduler for multiple events

Operating Parameters

- Temperature: 0 to +60°C (0 to 40°C ±1 min/year)
- Humidity: Up to 90% (non-condensing at 25°C)

Size: 19 x 9 x 1.75 in **Weight:** 3 lbs
48.3 x 22.9 x 4.5 cm 1.36kg

Power

- AC input, IEC power cord (100-240 VAC, 50/60 Hz)
- Power consumption 10W

In depth module datasheets on the following pages.

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Master Clock Upgrades

MCR Modules and Add-In Options

STANDARD MCR FEATURES
Manual time set via network and USB
NENA In/Out (Format 0, 1 and 8)
NMEA 0183 In (ZDA, GGA, GLL, RMC)
NMEA 0183 Out (ZDA)
NTP Input client software
PPS
Relay programmable - 1 event
RS232 Port
TCXO oscillator ± 1 min/year
TELNET network setup software
Time/Date data output via USB
USB Port
Windows USB setup software
Windows network setup software

ADD-IN FEATURES	Modules and Add-ins							
(M) - Module, (F) - Firmware, (S) - Software	GPS (M)	TCR (M)	TCG (M)	HSO (M)	PPO (M)	LED Display (M)	Event Time (S)	NTP (F)
Catalog Page Number	1.3.1	1.3.2	1.3.3	1.3.5	1.3.6	1.3.7	1.3.7	
10 MHz Output Sine Wave				√A				
Atomic Clock Accuracy	√							
Day of Year and Time/Date Display						√*		
IRIG-A & E Generator			√A					
IRIG-A & E Reader		√A						
IRIG-B & SMPTE/EBU Time Code Generator			√					
IRIG-B & SMPTE/EBU Time Code Reader		√						
Additional NMEA 0183 Out (ZDA, GGA, GLL, GSA, GSV, RMC, VTG)	√							
NTP Time Server Function								√
OCXO Oscillator ± .25 Seconds/Year				√				
PPO - Programmable Pulse Output					√			
Relay Programmable – Multiple Event							√	
Time Code Format Translation		√	√					
Time/Date Display						√*		

LEGEND

√ Module/Add-in provides selected feature.

√A Advanced version of option provides selected feature.

√* Different options are available for MCR1000 and MCR5000.

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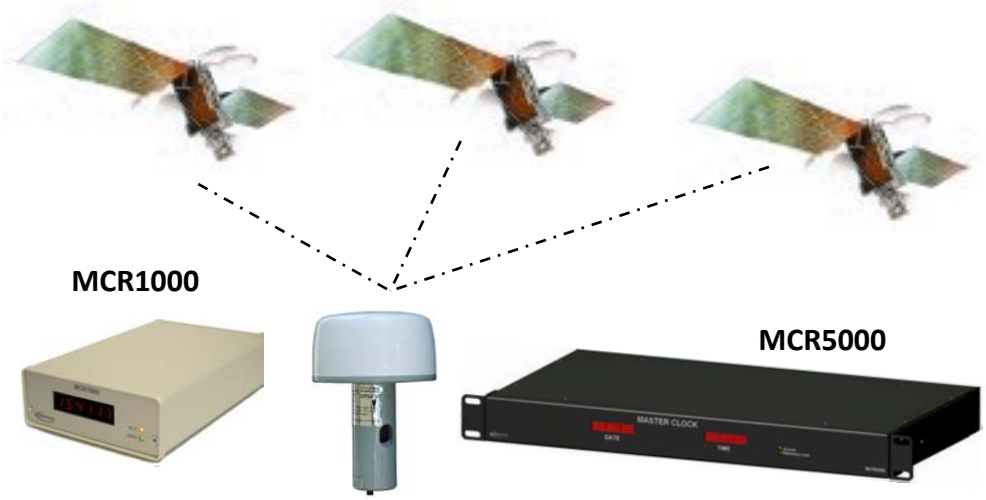
Master Clock Upgrades

MCR-GPS Module Option

Key Features

- Add to **MCR1000** or **MCR5000**
- Receives time signals from up to twelve GPS satellites
- Provides accurate reference to within ± 100 nS of UTC
- Optional **NMEA-0183** messages on serial port output
- Provides most accurate external time source for MCR
- Includes Standard Antenna
- Antenna cable lengths up to 500’ (152 m) available
- In-line surge arrestors and in-line GPS amplifiers available
- Compact design for portable applications

Masterclock’s **MCR-GPS** (**GPS Receiver**) is an add-in module option for the MCR100 and MCR5000 (both shown below). This inserted module provides a precision time reference based on GPS satellite broadcasts. The NMEA-0183 option is for marine applications. PPS on-time output is locked to the top of each second. **Order your MCR-GPS module when you order your MCR device.**



Specifications	MCR-GPS Module Receiver
Satellites	12-channel, up to 12 satellites simultaneously, parallel
Frequency	L1, 1575 MHz
Antenna Connector	SMA female
RF Bias to Antenna	3V DC, Center Pin
PPS	4 µs, TTL level, on-time leading edge
Accuracy	± 100 nS of UTC
	Standard Antenna
Type	Active, external
Gain	32 dB
Mount	Outdoor, threaded pipe/mast. M24 x 1.5 internal thread. Mounting kit provided.
Operating Temp	-40° to 85°C, (high humidity)
Voltage	3/5 VDC, center pin
Power Consumption	.24 W @ 22 mA
Polarization	Right hand circular
Weight	4.9 oz (*140 g*)
Impedance	50
Dimension	3.7” diameter x 4.9” length (*96mm x 126mm*)
Connector	SMA female
Antenna Cable	50’ (*15m*) Beldin 8219, 50 ohm low loss with SMA male connectors

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Master Clock Upgrades

MCR-TCR Module Options

Key Features

- Add to **MCR1000** or **MCR5000**
- Reads and synchronizes to SMPTE and IRIG Time Codes
- Software controlled
- Advanced TCR option available
- Autodetect and automatic gain control of incoming Time Code
- Optional interconnects with BNC9 female adapter, terminal block adapter (MCR1000) or BNC female, 3 POS terminal block (MCR5000)

Masterclock's **MCR-TCR (Time Code Reader)** is an add-in module option for master clock reference devices that reads and synchronizes to SMPTE or IRIG-B. An optional feature also reads IRIG-A and IRIG-E waveforms. The TCR option is software controlled and uses automatic gain control when it locks to the most accurate time reference available to the unit.

MCR1000 and MCR 5000 units may be ordered with this MCR-TCR option. Our affordable price and flexible order options make this unit popular in broadcast, industry, power distribution/monitoring and specialized military applications.

MCR1000 **MCR5000**

Specifications		Time Codes Read			Additional Time Codes w/Advanced TCR Option			
Format		**SMPTE 12M**	**IRIG-B DCLS**	**IRIG-B AM**	**IRIG-A DCLS**	**IRIG-A AM**	**IRIG-E DCLS**	**IRIG-E AM**
Rate		24,25, 30 fps NDF	1kHz, 1mS	1kHz, 1mS	10kHz, 0.1mS	10kHz, 0.1mS	100Hz, 10mS	100Hz, 10mS
Input Level Range		0.2 – 18Vpp 2 Vpp $_{nom}$	0.5 - 12 Vp 5Vpp $_{nom}$	0.5 – 8 Vpp 5 Vpp $_{nom}$	0.5 - 12 Vp 5Vp $_{nom}$	0.5 – 8 Vpp 5 Vpp $_{nom}$	0.5 - 12 Vp 5Vp $_{nom}$	0.5 – 8 Vpp 5 Vpp $_{nom}$
Input Impedance kΩ		>10 kΩ			>10 kΩ			
Mark to Space Ratio		NA	NA	3.3:1	NA	3.3:1	NA	3.3:1
Automatic Gain Adjust		Over input level range			Over input level range			
Number of Inputs SE: Single Ended – Unbalanced Differential – Balanced		1SE 1DIFF	1SE *1DIFF	1SE *1DIFF	1SE *1DIFF	1SE *1DIFF	1SE *1DIFF	1SE *1DIFF
Type		NDF	DCLS	AM 1kHz	DCLS	AM 10kHz	DCLS	AM 100Hz
ENCODING		None, Leitch Date, SMPTE 309M	None, IEEE 1344 year or IRIG STD 200-04		None or IEEE 1344 year or IRIG STD 200-04			
IRIG Coded Expression IRIG STD 200-04	**0 BCD_{TOY}, CF,SBS**	NA	B000	B120	A000	A130	E000	E110
	1 BCD_{TOY}, CF	NA	B001	B121	A001	A131	E001	E111
	2 BCD_{TOY}	NA	B002	B122	A002	A132	E002	E112
	3 BCD_{TOY},SBS	NA	B003	B123	A003	A133	E003	E113
	4 BCD_{TOY}, BCD_{Year}, CF, SBS (IEEE-1344 –1995 Encoding)	NA	B004	B124	A004	A134	E004	E114
	5 BCD_{TOY}, BCD_{Year}, CF	NA	B005	B125	A005	A135	E005	E115
	6 BCD_{TOY}, BCD_{Year},	NA	B006	B126	A006	A136	E006	E116
	7 BCD_{TOY}, BCD_{Year}, SBS	NA	B007	B127	A007	A137	E007	E117

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Master Clock Upgrades

MCR-TCG Module Option

Key Features

- Add to **MCR1000** or **MCR5000**
- Generates SMPTE and IRIG-B time codes, plus optional IRIG-A and -E
- Locks to GPS Receiver, Time Code Reader, NTP Client and HSO
- Optional Interconnects with BNC9 female adapter, Terminal Block adapter (MCR1000) BNC female, 3 POS Terminal Block (MCR5000)

Masterclock's **MCR-TCG** (**Time Code Generator**) is an add-in module option for master clock reference devices that generates SMPTE or IRIG-B time code signals. An optional feature also generates IRIG-A and IRIG-E waveforms. The TCG option is software controlled and locks to GPS satellites.

MCR1000 and MCR 5000 units may be ordered with this MCR-TCG option. Our affordable price and flexible order options make this unit popular in broadcast, industry, power distribution/monitoring and specialized military applications.

MCR1000

MCR5000

Specifications		Time Codes Generated			Additional Time Codes w/ Advanced TCG Option			
Format		**SMPTE 12M**	**IRIG-B DCLS**	**IRIG-B AM**	**IRIG-A DCLS**	**IRIG-A AM**	**IRIG-E DCLS**	**IRIG-E AM**
Rate		24,**25, 30 fps NDF**	1kHz, 1mS	1kHz, 1mS	10kHz, 0.1mS	10kHz, 0.1mS	100Hz, 10mS	100Hz, 10mS
Output Level @ 600Ω		4Vpp (5.2 dBm)	3 Vp (2.7 dBm)	4Vpp (5.2 dBm)	3 Vp (2.7 dBm)	4Vpp (5.2 dBm)	3 Vp (2.7dBm)	4Vpp (5.2 dBm)
Output Level @ 50 Ω		3Vpp (13.5dBm)	1.75Vp (8.8dBm)	3Vpp (13.5dBm)	1.75Vp (8.8dBm)	3Vpp (13.5dBm)	1.75Vp (8.8dBm)	3Vpp (13.5dBm)
Mark to Space Ratio		NA	NA	3.3:1	NA	3.3:1	NA	3.3:1
Gain		1	1	1	1	1	1	1
Number of Outputs SE: Single Ended - Unbalanced Differential- Balanced (*excludes model MCR1000)		1SE *1DIFF	1SE *1DIFF	1SE *1DIFF	1SE *1DIFF	1SE *1DIFF	1SE *1DIFF	1SE *1DIFF
Type		NDF	DCLS	AM 1kHz	DCLS	AM 10kHz	DCLS	AM 100Hz
ENCODING		None, Leitch Date, SMPTE 309M	None or IEEE 1344 year or IRIG STD 200-04		None or IEEE 1344 year or IRIG STD 200-04		None or IEEE 1344 year or IRIG STD 200-04	
IRIG Coded Expression IRIG STD 200-04	**0 BCD_{TOY}, CF,SBS**	NA	B000	B120	A000	A130	E000	E110
	1 BCD_{TOY}, CF	NA	B001	B121	A001	A131	E001	E111
	2 BCD_{TOY}	NA	B002	B122	A002	A132	E002	E112
	3 BCD_{TOY},SBS	NA	B003	B123	A003	A133	E003	E113
	4 BCD_{TOY}, BCD_{Year}, CF,SBS (IEEE-1344 –1995 Encoding)	NA	B004	B124	A004	A134	E004	E114
	5 BCD_{TOY}, BCD_{Year}, CF	NA	B005	B125	A005	A135	E005	E115
	6 BCD_{TOY}, BCD_{Year},	NA	B006	B126	A006	A136	E006	E116
	7 BCD_{TOY}, BCD_{Year}, SBS	NA	B007	B127	A007	A137	E007	E117

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Master Clock Upgrades

NMEA Input/Output Firmware Option

Key Features

- Add to **MCR1000** and **MCR5000**
- Reads, synchronizes to and outputs from NMEA-0183 ASCII messages
- Transmitted over RS-232, Ethernet and USB ports
- Software controlled
- Supports baud rates from 4,800 to 57,600

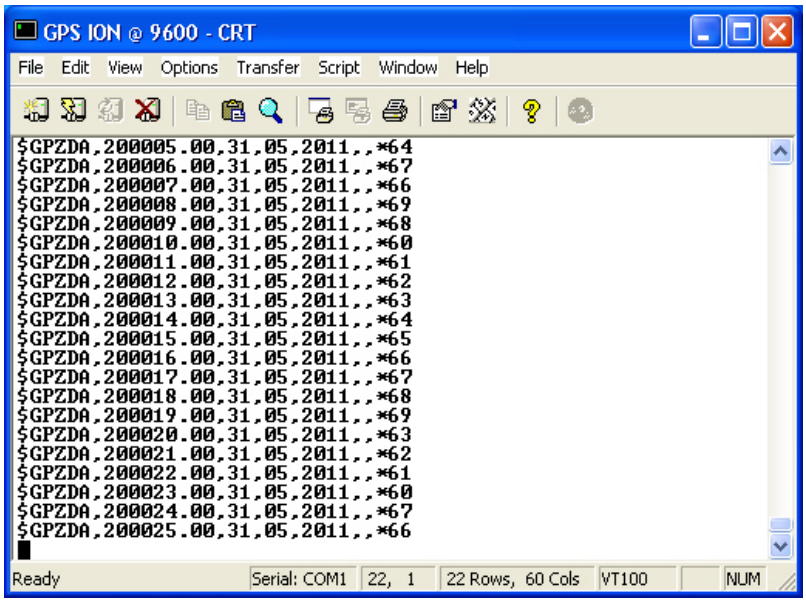
Masterclock's **MCR-NMEA** is an add-in firmware option for master clock reference devices that reads, synchronizes and outputs NMEA-0183 messages.

The NMEA input option automatically detects and locks to the incoming NMEA-0183 messages arriving from GPS satellites.

National Marine Electronics Association

NMEA-0183 →

Time and date ←



Specifications	Input/Output NMEA time stamped messages
Messages Supported	**ZDA, GGA*, GLL*, GSA*, GSV*, RMC*, VTG***
Baud Rates Supported	**4800**, 9600, 19200, 38400, 57600
Data Bits	**8**, 7
Parity	**None**, Odd, Even
Stop bits	**1**, 2
Decode Rate	Up to once per second per message
Accuracy	Within 10 ms of receipt of first character of NMEA packet. Overall accuracy to UTC top of second is dependent upon the NMEA output

*Requires MCR-GPS Module to output. **Default options are bold.**

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Master Clock Upgrades

MCR-HSO Module Options

Key Features

- Add to **MCR1000** or **MCR5000**
- Available in three precision grade levels (see chart)
- Typical holdover stability of 1 ppb/day, or better with OCXO
- Optional 10MHz frequency reference output
- Locks to most accurate time source (GPS Receiver, Time Code Reader, NTP Client)
- **Optional 10MHz reference output**

MCR1000

MCR5000

***MCR-HSO* Module**

Masterclock's MCR-HSO (High Stability Oscillator) is an add-in module for master clock reference devices. It provides precision time and frequency for a wide range of applications. Affordable price and flexible order options make this a popular add-in for meeting critical time keeping during holdover (loss of primary reference such as GPS), as well as for specialized applications requiring a precise frequency reference.

The HSO crystal oscillator (OCVCXO) maintains excellent holdover stability of up to 1 ms day. For time and frequency critical applications the rubidium atomic option can provide a time stability of better than 1 ms per year with frequency stability of up to $1x10^{-12}$.

When not tied to GPS, a precision frequency 10MHz reference output is available as a source for laboratory use or for an RF reference, including cellular applications. The MCR-HSO option is required for all 10 MHz signal outputs.

When locked to GPS, the OCXO 10 MHz sine wave frequency will have the same long-term stability as an atomic clock.

Freq = 10.000000 MHz		**1** Available in MCR-1000 and MCR-5000	**2** Available in MCR-1000 and MCR-5000	**COMING SOON** Available in MCR-5000 only
Oscillator Type		VCTXO	OCVCXO	Rubidium Atomic
Level (dBm) @ 50Ohms		7dBm ±2dBm	7dBm ±1dBm	7dBm ±1dBm
Freq Stability - Aging /day		TBD	(1x10E-9)	(4x10E-11)
Freq Stability - Aging/year		±1 ppm/year ($1x10E^{-6}$)	±0.3 ppm/year ($3x10E^{-7}$)	±0.0015 ppm/year ($1.5x10E^{-9}$)
Short Term Stability (Allan Variance) 1 sec gate		TBD	≤ 1.0 e^{-10}	≤ 5.0 e^{-11}
Time Drift per Year (max)		±3 sec	±.0.3 sec	±1.5 ms Note 1
Optional Outputs – (10 MHz Output Option)		1 **(clipped sine wave)**	1 **Sine wave**	1 **Sine wave**
Phase Noise (dBc/Hz) @ 10MHz	**1Hz**	NA	<-85dBc/Hz	<-65dBc/Hz
	10Hz	NA	<-115dBc/Hz	<-85dBc/Hz
	100Hz	NA	<-140dBc/Hz	<-112dBc/Hz
	1kHz	NA	<-150dBc/Hz	<-130dBc/Hz
	10kHz	NA	<-155dBc/Hz	<-140dBc/Hz

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Master Clock Upgrades

MCR-PPO Module Option

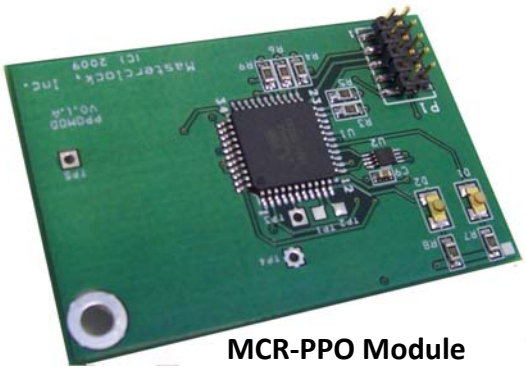
Key Features

- Add to **MCR1000** and **MCR5000**
- User programmable pulse width of .0001 to 214,747 seconds (2.4 days), with 100 µs resolution
- Edge triggered at top of second and synchronized to PPS
- One-shot, pulse train, or frequency generator modes with number of cycles up to 4 million
- Active high or active low pulse

Masterclock's **MCR-PPO** (**Programmable Pulse Output**) is an add-in module for master clock reference devices that provides a precision time referenced pulse output synchronized to the PPS of your master clock reference.

Pulse widths from 100 µs to over 2 days, with resolution of 50 µs, are achievable. You may set your pulse to be active high or active low, triggered from the top of each second. Pulses may be one shot, or you may use the PPO module to produce pulse trains or as a frequency generator.

Each MCR may be ordered with an MCR-PPO module option.



MCR-PPO Module

MCR1000

MCR5000

SPECIFICATIONS	Programmable Pulse Output Option
Modes	Frequency generator, one-shot pulse generator, pulse train (programmable cycles)
Frequency Range	4.657 e-6 Hz to 200 kHz
Pulse Width Range	.0001 seconds to 214,747 seconds
Resolution	100 µs
Programmable cycles	1 to 4,000,000 (0 cycles = continuous free running)
Accuracy	± 50 µs of PPS edge
Pulse Type	Active High or Active Low (5V at 20mA)
Trigger	MCR System PPS

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Master Clock Upgrades

Digit Display Options and Event Time Basic

Choose from MCR1000 six- and nine-digit models

Choose from MCR5000 six- and twelve-digit models

Event Time Basic

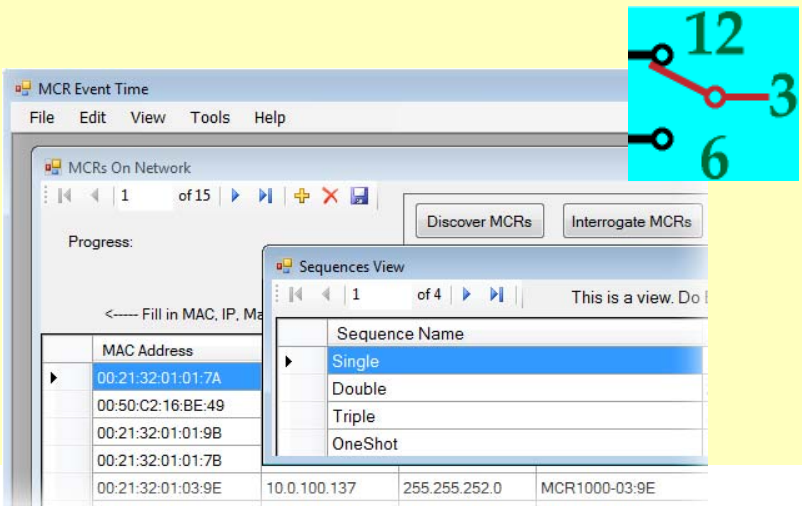
MCR Event Time Basic is a Windows® application that allows a user to create a schedule for the activation of the relay switches in the MCR1000 and MCR5000.

It is highly configurable, allowing a user to do all of this:

- Define several sequences of on/off states for the relay.
- Assign each sequence to a named event.
- Schedule events during a standard day, a holiday or an exception day.
- Name holidays and exceptions.
- Schedule an entire year of events.
- Save an unlimited number of schedules.
- Send the schedule to an MCR.
- View all of the MCRs on the network.
- Interrogate MCRs about their status.
- Test the relay in the MCR.
- Turn the schedule on and off.

The demo allows the user to test all features and to save his schedules, but not to send a schedule to an MCR.

The customer receives the fully-enabled version of this application when the user purchases an MCR1000 or MCR5000 with the option called "**MCR Event Time Basic Software**".



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Master Clock Upgrades

Digit Display Options and Event Time Basic

CE

Choose from MCR1000 six- and nine-digit models

Choose from MCR5000 six- and twelve-digit models

Event Time Basic

MCR Event Time Basic is a Windows® application that allows a user to create a schedule for the activation of the relay switches in the MCR1000 and MCR5000.

It is highly configurable, allowing a user to do all of this:

- Define several sequences of on/off states for the relay.
- Assign each sequence to a named event.
- Schedule events during a standard day, a holiday or an exception day.
- Name holidays and exceptions.
- Schedule an entire year of events.
- Save an unlimited number of schedules.
- Send the schedule to an MCR.
- View all of the MCRs on the network.
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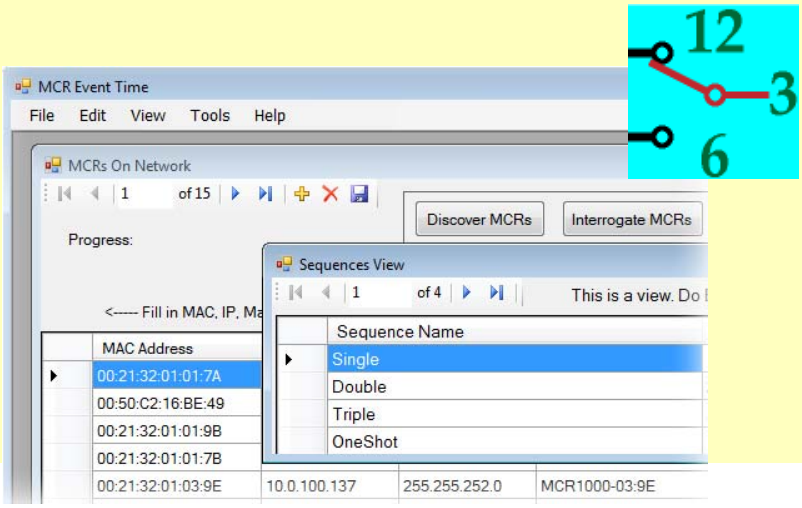

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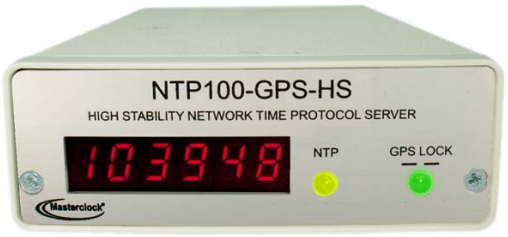
Dedicated Master Clocks

NTP100-GPS-HS



FEATURES

- NTP reference for Ethernet LANs in self-contained box
- Time synchronized to atomic clock in GPS satellites providing Stratum 1 accuracy
- Typical holdover stability of 1ppb/day (<7 sec/year) using high precision internal OCXO during GPS loss.
- NTP query (Unicast), Multicast or Broadcast modes
- Assignable network configuration
- Telnet or serial interface – WinDiscovery control included
- Uses state-of-the-art 8 channel Trimble receiver module

Rack mountable with an **RM4**

SPECIFICATIONS

Outputs

- NTP reference for query (Unicast), Multicast, or Broadcast mode – user definable

Rack Mount

- Optional rack mount kit available - RM4

Connectors

- RJ45 – 10MB, half duplex Ethernet connection
- DC input – 2.1 mm male jack
- Antenna – SMA
- RS-232 – 9 pin male

Physical

Size:	6.75 x 4.13 x 1.5 in 17.15 x 10.48 x 3.81 cm	**Weight:**	17.3 oz 490.5 g

Case

- Cover: Off white aluminum
- Front/rear panel: Clear anodized aluminum

Compliance

- CE Marked – Available for sale in EU
- FCC, Part 15, Class B, emissions

Time Reference

- When synchronized to atomic clocks in GPS satellites the long term accuracy of the NTP100 is the same as the atomic clock of the GPS
- After initial synchronization and (if) upon loss of GPS signal the NTP100 will revert to an internal temperature compensated crystal oscillator and typically maintain accuracy of <165 µSec per day.

Power Supply

- 9-28 VDC Input. Includes an external 12 VDC wall mount power supply with locking DC plug, UL & CE listed.
- 115/220 VAC, 50/60 Hz, <10W Power AC Input
- Supplied with your choice of US, Euro, British or
- AUS/NZ plug- others optionally available

Operating Parameters

- Temperature: 0 to +50°C
- Humidity: Up to 90% (non-condensing at 25°C)

Antenna

- A weather-proof, pre-amplified antenna is included with 16’ (5m) of coaxial cable. An optional antenna kit is available with antenna, 50’(15m) cable and antenna mounting bracket.

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Dedicated Master Clocks

NTP100-OSC

FEATURES

- NTP reference for Ethernet LANs in self-contained box
- Time synchronized to internal precision temperature compensated crystal oscillator (TXCO)
- NTP query (Unicast), Multicast or Broadcast modes
- Assignable network configuration
- Telnet or serial interface – WinDiscovery control included

Rack mountable with an **RM4**

SPECIFICATIONS

NTP Time Accuracy

- After initial input of time setting the NTP100-OSC will typically maintain accuracy of ± 1min/year or < 165ms per day using an internal TCXO and battery backed real-time clock circuit.

Outputs

- NTP reference for query (Unicast), Multicast, or Broadcast mode – user definable

Rack Mount

- Optional rack mount kit available - RM4

Connectors

- RJ45 – 10MB, half duplex Ethernet connection
- DC input – 2.1 mm male jack
- RS-232 – 9 pin male

Physical

Size:	6.75 x 4.13 x 1.5 in 17.15 x 10.48 x 3.81 cm	**Weight:**	17.3 oz 490.5 g

Case

- Cover: Off white aluminum
- Front/rear panel: Clear anodized aluminum

Compliance

- CE Marked – Available for sale in EU
- FCC, Part 15, Class B, emissions

Time Reference

- Supports DHCP/BOOTP for automatic acquisition of network address, nameservers, and timeserver configuration.
- Provides dynamic configuration for networking parameters.
- Configure clocks through provided network WinDiscovery tool or TELNET
- Network discovery tool provides automatic discovery of NTP clocks attached to network without changing PC's networking configuration.
- Configuration is saved to non-volatile memory and survives power losses.
- Authenticated network messages prevent unauthorized tampering of clock configuration.

Power Supply

- 9-28 VDC Input. Includes an external 12 VDC wall mount power supply with locking DC plug, UL & CE listed.
- 115/220 VAC, 50/60 Hz, <10W Power AC Input
- Supplied with your choice of US, Euro, British or AUS/NZ plug- others optionally available

Operating Parameters

- Temperature: 0 to +50°C
- Humidity: Up to 90% (non-condensing at 25°C)

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Dedicated Master Clocks

NTP100-OSC-HS

FEATURES

- NTP reference for Ethernet LANs in self-contained box
- NTP time synchronized to an internal precision oven controlled crystal oscillator (OXCO) for typical stability of 1 ppb/day (< 7 sec/year) after 30 days of aging.
- NTP query (Unicast), Multicast or Broadcast modes
- Assignable network configuration
- Telnet or serial interface – WinDiscovery control included

Rack mountable with an **RM4**

SPECIFICATIONS

NTP Time Accuracy

- After initial input of time setting and 30 days aging the NTP100-OSC will typically maintain stability of 1ppb/day (<19mS/day) or <7 sec/year using an internal high precision OCXO (oven controlled crystal oscillator) and battery backed real-time clock circuit.

Outputs

- NTP reference for query (Unicast), Multicast, or Broadcast mode – user definable

Rack Mount

- Optional rack mount kit available - RM4

Connectors

- RJ45 – 10MB, half duplex Ethernet connection
- DC input – 2.1 mm male jack

Physical

Size:	6.75 x 4.13 x 1.5 in 17.15 x 10.48 x 3.81 cm	**Weight:**	17.3 oz 490.5 g

Case

- Cover: Off white aluminum
- Front/rear panel: Clear anodized aluminum

Compliance

- CE Marked – Available for sale in EU
- FCC, Part 15, Class B, emissions

Time Reference

- Supports DHCP/BOOTP for automatic acquisition of network address, nameservers, and timeserver configuration.
- Provides dynamic configuration for networking parameters.
- Configure clocks through provided network WinDiscovery tool or TELNET
- Network discovery tool provides automatic discovery of NTP clocks attached to network without changing PC's networking configuration.
- Configuration is saved to non-volatile memory and survives power losses.
- Authenticated network messages prevent unauthorized tampering of clock configuration.

Power Supply

- 9-28 VDC Input. Includes an external 12 VDC wall mount power supply with locking DC plug, UL & CE listed.
- 115/220 VAC, 50/60 Hz, <10W Power AC Input
- Supplied with your choice of US, Euro, British or AUS/NZ plug- others optionally available

Operating Parameters

- Temperature: 0 to +50°C
- Humidity: Up to 90% (non-condensing at 25°C)

Masterclock, Inc.

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Dedicated Master Clocks

NTP100-TC

FEATURES

- NTP reference for Ethernet LANs in self-contained box
- Time synchronized to your existing IRIG or SMPTE time code source
- NTP query (Unicast), Multicast or Broadcast modes
- Assignable network configuration
- Telnet or serial interface – WinDiscovery control included

Rack mountable with an **RM4**

SPECIFICATIONS

NTP Time Accuracy

- When synchronized to external time code source – long term accuracy is same as external source
- With loss of time code unit will revert to internal oscillator with accuracy of better than 165 µSec/day

Rack Mount

- Optional rack mount kit available - RM4

Connectors

- RJ45 – 10MB, half duplex Ethernet connection
- DC input – 2.1 mm male jack

Physical

Size:	6.75 x 4.13 x 1.5 in 17.15 x 10.48 x 3.81 cm	**Weight:**	17.3 oz 490.5 g

Case

- Cover: Off white aluminum
- Front/rear panel: Clear anodized aluminum

Compliance

- CE Marked – Available for sale in EU
- FCC, Part 15, Class B, emissions

Time Reference

- Supports DHCP/BOOTP for automatic acquisition of network address, nameservers, and timeserver configuration.
- Provides dynamic configuration for networking parameters.
- Configure clocks through provided network WinDiscovery tool or TELNET
- Network discovery tool provides automatic discovery of NTP clocks attached to network without changing PC's networking configuration.
- Configuration is saved to non-volatile memory and survives power losses.
- Authenticated network messages prevent unauthorized tampering of clock configuration.

Power Supply

- 9-28 VDC Input. Includes an external 12 VDC wall mount power supply with locking DC plug, UL & CE listed.
- 115/220 VAC, 50/60 Hz, <10W Power AC Input
- Supplied with your choice of US, Euro, British or
- AUS/NZ plug- others optionally available

Operating Parameters

- Temperature: 0 to +50°C
- Humidity: Up to 90% (non-condensing at 25°C)

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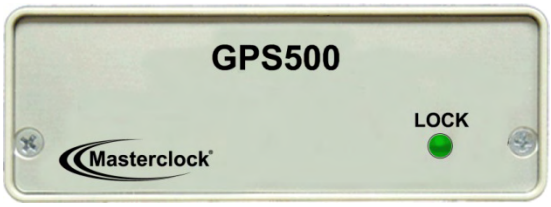
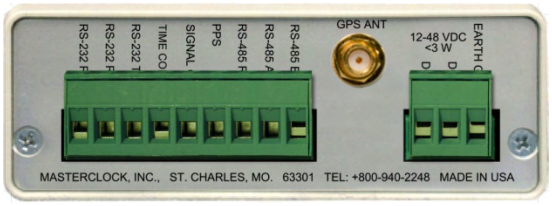
GPS Referred Master Clock

GPS500





Rack Mountable with RM4 Adaptor

FEATURES

- Generates SMPTE / EBU or IRIG-B Time Codes
- Synchronized to atomic clocks in GPS satellites
- -11.5 to +12 hour time zone offsets in 30-minute increments
- Automatic daylight saving (North America and EU standards)
- NMEA/Kinemetrics / Truetime serial protocol output
- Wide power supply input range: 12 to 48 VDC
- Switch selectable time zone and DST
- Switch selectable interval blanking (for Schneider ION Meters®)
- Switch selectable format and baud rate

SPECIFICATIONS

Time Reference

- When synchronized a GPS500's accuracy is as accurate as a GPS satellite atomic clock
- After initial synchronization, should the GPS500 lose GPS signal it will revert to an internal TCXO oscillator and maintain an accuracy of 1 minute/year

Outputs

- SMPTE Time Code
  - SMPTE, EBU 24, 25 or 30fps
- IRIG-B Time Code
  - IRIG-B - 1 kHz modulated, level - 5 Vpp
  - IRIG-B – unmodulated, single ended 5 V
- PPS (Pulse Per second)
  - 5 V-TTL, Accuracy ± 1 us (when synchronized)
- RS-232/ASCII
  - Time code information available via RS-232
  - NMEA
  - Kinemetrics/Truetime serial protocol output
- RS-485 serial protocol output
- DATE
  - Date encoded references (IRIG 1344 and SMPTE 309M)

Rack Mount

- Optional rack mount kit is available - RM4

Connectors

- Output : 9-pin removable terminal block
- Power plug: 3-pin removable terminal block
- Antenna: SMA female

Physical

Size:	5.5 x 4.13 x 1.5 in 14 x 10.48 x 3.81 cm	**Weight:**	17.3 oz 490.5 g

Case

- Cover: Off-white aluminum
- Front/rear panel: Clear anodized aluminum

Compliance

- CE marked – Available for sale in EU [pending]
- FCC, Part 15, Class B emissions

Power Supply

- 12 VDC external wall mount supplied; UL, CE listed
- 115/220, 50/60 Hz
- Supplied with US, Euro-plug, British or AUS/NZ - others optionally available

Antenna Options

- **Basic** antenna package includes magnetic GPS antenna and 15' (5m) of cable
- **Standard** antenna package includes marine GPS antenna, mounting kit, and 50' (15m) of cable.

Operating Parameters

- Temperature: 0 to +70°C
- Humidity: Up to 90% (non-condensing at +25°C)

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Time Code Oscillator

Model # TCO-100

FEATURES

- Generates SMPTE, EBU, 30, 25 and 24 fps or IRIG-B (modulated and unmodulated) Time Codes
- Functions as a backup Time Code source for master clock systems
- Can be connected to a GPS-500 master clock generator to automatically synchronize to GPS atomic clock time.
- With loss of signal the TCO-100 will revert to a highly stable internal crystal oscillator and continue to provide an accurate Time Code output.
- Automatic Daylight Savings Time adjustment for North America and available for other countries
- 9-28 VDC converted from 115/220 VAC with supplied external wall mounted power supply
- Temperature Compensated Crystal Oscillator (TCXO) provides accuracy of ±1 minute/year (<165 ms / day)
- Six-digit red LED time or date display (user selectable) on front panel
- Front panel date and time set mode switches for manual operation
- All functions can be controlled via RS-232
- -11.5 to +12 hour selectable Time Zone offsets in 30 minute increments

Rack mountable with **RM4**

SPECIFICATIONS

I/O Connections

- Input power: 9-28 VDC
  2.1 mm male power connector
- Power consumption: < 2 watts
- Supplied with wall mounted 12 VDC power supply
- Time Code output: DB-9 male
  (supplied with DB-9 to BNC adapter)
- RS-232, PPS pulse: DB-9 male

Case

- Cover: Off-white aluminum
- Front/rear panel: Clear anodized aluminum

Physical

Size:	4.2w x 1.5h x 5.5d inches 10.48w x 3.81h x 14d cm	**Weight:**	16 oz 435 g

Operating Parameters

- Temperature: 0 to +60°C
- Humidity: Up to 90% (non-condensing at +25°C)

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Rack Mount Network Time Clock

NTDS16

FEATURES

- 1” (2.54cm), 6-digit LED – display colors available in amber, blue, red and green
- Syncs to external or internal NTP source for accurate traceable time
- Display time in 12- or 24-hour format or date
- Display date or alternate between time and date
- Adjustable brightness levels
- All international time zones and automatic daylight saving times
- Wireless network available on special order
- Standard chassis color is black powder coat; other colors available
- Power-over-Ethernet or worldwide AC power

SWIVEL BRACKET OPTION AVAILABLE

SPECIFICATIONS

Setup and Control Software

- Supports DHCP/BootP for automatic acquisition of network address, nameservers and time servers
- Provides dynamic configuration for networking parameters, time zone/daylight saving time
- Configure clocks through provided WinDiscovery software or TELNET
- WinDiscovery provides easy discovery and configuration of NTP clocks attached to the network without changing PC’s network configuration
- Configuration is saved to non-volatile memory
- Encrypted network messages prevent unauthorized tampering of clock configuration

Standard Rack Mount – 1RU – “Ears” removable

Size:	16.9w x 1.7h x 3.5d in 43w x 4.31h x 8.9d cm	**Weight:**	1.73 lb 0.78g

Operating Limitations

- Temperature: 0 to +60°C
- Humidity: Up to 90% (non-condensing)

Connectors

- Ethernet – RJ45
- USB connector for setup
- Small IEC connector (320-6)

Power

- Power consumption 15W
- PoE (to IEEE 802.3af standard) or
- International AC - 115/230, 50/60 Hz
- Supplied with choice of US, Euro, British or AUS/NZ power cord – others available

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Rack Mount Network Time Clock

NTDS19

FEATURES

- 1” (2.54cm), 9-digit LED – display colors available in **amber**, **blue**, **red** and **green**
- Syncs to external or internal NTP source for accurate traceable time
- Day of the Year plus display time in 12- or 24-hour format or date
- Display date or alternate between time and date
- Adjustable brightness levels
- All international time zones and automatic daylight saving times
- Wireless network available on special order
- Standard chassis color is black powder coat; other colors available
- Power-over-Ethernet or worldwide AC power

SWIVEL BRACKET OPTIONAL

SPECIFICATIONS

Setup and Control Software

- Supports DHCP/BootP for automatic acquisition of network address, nameservers and time servers
- Provides dynamic configuration for networking parameters, time zone/daylight saving time
- Configure clocks through provided WinDiscovery software or TELNET
- WinDiscovery provides easy discovery and configuration of NTP clocks attached to the network without changing PC’s network configuration
- Configuration is saved to non-volatile memory
- Encrypted network messages prevent unauthorized tampering of clock configuration

Standard Rack Mount – 1RU – “Ears” removable

Size:	16.9w x 1.7h x 3.5d in 43w x 4.31h x 8.9d cm	**Weight:**	1.73 lb 0.78g

Operating Limitations

- Temperature: 0 to +60°C
- Humidity: Up to 90% (non-condensing)

Connectors

- Ethernet – RJ45
- USB connector for setup
- Small IEC connector (320-6)

Power

- Power consumption 15W
- PoE (to IEEE 802.3af standard) or
- International AC - 115/230, 50/60 Hz
- Supplied with choice of US, Euro, British or AUS/NZ power cord – others available

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Rack Mount Network Time Clock

NTDS112

FEATURES

- 1" (2.54cm), 12-digit LED – display colors available in **amber**, **blue**, **red** and **green**
- Syncs to external or internal NTP source for accurate traceable time
- Display time in 12- or 24-hour format or date
- Display date or alternate between time and date
- Adjustable brightness levels
- All international time zones and automatic daylight saving times
- Wireless network available on special order
- Standard chassis color is black powder coat; other colors available
- Power-over-Ethernet or worldwide AC power

SWIVEL BRACKET OPTION AVAILABLE

SPECIFICATIONS

Setup and Control Software

- Supports DHCP/BootP for automatic acquisition of network address, nameservers and time servers
- Provides dynamic configuration for networking parameters, time zone/daylight saving time
- Configure clocks through provided WinDiscovery software or TELNET
- WinDiscovery provides easy discovery and configuration of NTP clocks attached to the network without changing PC's network configuration
- Configuration is saved to non-volatile memory
- Encrypted network messages prevent unauthorized tampering of clock configuration

Standard Rack Mount – 1RU – "Ears" removable

Size:	16.9w x 1.7h x 3.5d in 43w x 4.31h x 8.9d cm	**Weight:**	1.73 lb 0.78g

Operating Limitations

- Temperature: 0 to +60°C
- Humidity: Up to 90% (non-condensing)

Connectors

- Ethernet – RJ45
- USB connector for setup
- Small IEC connector (320-6)

Power

- Power consumption 15W
- PoE (to IEEE 802.3af standard) or
- International AC - 115/230, 50/60 Hz
- Supplied with choice of US, Euro, British or AUS/NZ power cord – others available

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NTP Digital Clock

NTDS 24

Dual Face Option

FEATURES

- 2.3" (5.8cm), 6-digit LED available in red, green, amber and blue
- Syncs to external or internal NTP source for accurate traceable time
- Display time in 12- or 24- hr format – hh:mm:ss
- Display date - MM:dd:yy or dd:MM:yy or yy:MM:dd – configurable
- Adjustable brightness levels
- All international Time Zones and automatic Daylight Saving Times
- Wireless network available on special order
- Standard chassis color is black powder coat
- PoE (Power-over-Ethernet) or worldwide AC Power
- CE marked for sale in EU – FCC, Class B, Emissions
- New! Dry contact relay option - Upon loss of lock from NTP source NO/NC dry contact relay inside the clock is energized

CE

Wall Mount Bracket	
Tilt Wall Bracket Option	
Flush Mount Bracket Option	

SPECIFICATIONS

Setup and control software

- Supports DHCP/BOOTP for automatic acquisition of network address, nameservers, and time server configuration
- Provides dynamic configuration for networking parameters, time zone/daylight saving time
- Configure clocks through provided WinDiscovery software or TELNET
- WinDiscovery tool provides automatic discovery of NTP clocks attached to network without changing PC's network configuration
- Configuration is saved to non-volatile memory
- Password protection prevents unauthorized tampering of clock configuration

Physical

Powder-coated, non-rusting, welded steel chassis

Size:	10.1w x 3.75h x 1.57d in 25.7w x 9.6h x 4d cm	**Weight:**	2.1 lbs 0.9 kg

Connectors

- Ethernet – RJ45
- USB connector for setup (option)
- 2.1mm locking DC input jack (DC option)

Power

- Power consumption: 15W
- PoE (to IEEE 802.3af standard) or
- **AC option** - International 115/230, 50/60 Hz, supplied with your choice of US, Euro, British or AUS/NZ power cord – others available
- **DC option** - includes external AC to DC wall-mount power supply with locking DC plug

Operating Temperature and Humidity

- Temperature: 0 to +60°C
  (0 to +40°C, ±1 min/year for standard TCXO)
- Humidity: Up to 90%, non-condensing

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NTP Digital Clock

NTDS 26

Wall-mount bracket -or- 2U Rack-mount bracket (specify)	
Tilt Wall Bracket Option	
Flush Mount Bracket Option	
Dual Face Ceiling Mount Option	

FEATURES

- 2.3" (5.8cm), 6-digit LED available in **red**, **green**, **amber** and **blue**
- Syncs to external or internal NTP source for accurate traceable time
- Display time in 12- or 24- hr format – **hh:mm:ss**
- Display date - **MM:dd:yy** or **dd:MM:yy** or **yy:MM:dd** – configurable
- Adjustable brightness levels
- All international Time Zones and automatic Daylight Saving Times
- Wireless network available on special order
- Standard chassis colors is black powder coat
- PoE (Power-over-Ethernet) or worldwide AC Power
- CE marked for sale in EU – FCC, Class B, Emissions
- New! Dry contact relay option - Upon loss of lock from NTP source NO/NC dry contact relay inside the clock is energized

CE

SPECIFICATIONS

Setup and control software

- Supports DHCP/BOOTP for automatic acquisition of network address, nameservers, and time server configuration
- Provides dynamic configuration for networking parameters, time zone/daylight saving time
- Configure clocks through provided WinDiscovery software or TELNET
- WinDiscovery tool provides automatic discovery of NTP clocks attached to network without changing PC's network configuration
- Configuration is saved to non-volatile memory
- Password protection prevents unauthorized tampering of clock configuration

Physical

Powder-coated, non-rusting, welded steel chassis

Size:	16.9w x 3.43h x 3d in 43w x 8.7h x 7.6d cm	**Weight:**	3.85 lbs 1.7 kg

Connectors

- Ethernet – RJ45
- USB connector for setup (option)
- 2.1mm locking DC input jack (DC option)

Power

- Power consumption: 15W
- PoE (to IEEE 802.3af standard) or
- **AC option** - International 115/230, 50/60 Hz, supplied with your choice of US, Euro, British or AUS/NZ power cord – others available
- **DC option** - includes external AC to DC wall-mount power supply with locking DC plug

Operating Temperature and Humidity

- Temperature: 0 to +60°C
  (0 to +40°C, ±1 min/year for standard TCXO)
- Humidity: Up to 90%, non-condensing

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NTP Digital Clock

NTDS 29

FEATURES

- 1.8" (4.6 cm), 9-digit LED available in **red**, **green**, **amber** and **blue**
- Syncs to external or internal NTP source for accurate traceable time
- Display time in 12- or 24- hr format – **hh:mm:ss**
- Three digit **Day of Year** display (on left)
- Display date – **MM:dd:yy** or **dd:MM:yy** or **yy:MM:dd** – configurable
- Adjustable brightness levels
- All international Time Zones and automatic Daylight Saving Times
- Wireless network available on special order
- Standard chassis color is black powder coat
- PoE (Power-over-Ethernet) or worldwide AC Power
- CE marked for sale in EU – FCC, Class B, emissions
- New! Dry contact relay option - Upon loss of lock from NTP source NO/NC dry contact relay inside the clock is energized

CE

Wall Mount Bracket -or- Bracket for 19" 2U Rack (specify)	
Tilt Wall Bracket Option	

SPECIFICATIONS

Setup and control software

- Supports DHCP/BOOTP for automatic acquisition of network address, nameservers, and time server configuration
- Provides dynamic configuration for networking parameters, Time Zone/Daylight Savings Time
- Configure clocks through provided WinDiscovery software or TELNET
- WinDiscovery tool provides automatic discovery of NTP clocks attached to network without changing PC's network configuration
- Configuration is saved to non-volatile memory
- Password protection prevents unauthorized tampering of clock configuration

Physical

Powder-coated, non-rusting, welded steel chassis

Size:	17.5w x 3.75h x 3.0d in 44.5w x 9.6h x 7.6d cm	**Weight:**	3.2 lbs 1.4 kg

Connectors

- Ethernet – RJ45
- USB connector for setup (option)
- 2.1mm locking DC input jack (DC option)

Power

- Power consumption: 15W
- PoE (to IEEE 802.3af standard) or
- **AC option** - International 115/230, 50/60 Hz, supplied with your choice of US, Euro, British or AUS/NZ power cord – others available
- **DC option** - includes external AC to DC wall-mount power supply with locking DC plug

Operating Temperature and Humidity

- Temperature: 0 to +60°C
  (0 to +40°C, ±1 min/year for standard TCXO)
- Humidity: Up to 90%, non-condensing

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NTP Driven Clock

NTDS 44

FEATURES

- 4" (10.2cm), four-digit LED
- Display colors available in **red**, **green**, **amber** and **blue**
- Syncs to external or internal NTP source for accurate traceable time
- Display time in 12- or 24-hour format – **hh:mm:ss**
- Display date – **MM:dd** or **dd:MM** or alternate
- Adjustable brightness
- All international Time Zones and automatic Daylight Savings Times
- Wireless network available on special order
- Standard chassis color is black powder coat
- PoE or DC input (with AC adapter)
- CE marked for sale in EU, FCC, Class B, emissions

Wall-mount, ceiling mount, tilt-mount and flush-mount brackets available

SPECIFICATIONS

Setup and control software

- Supports DHCP/BOOTP for automatic acquisition of network address, nameservers and time servers
- Provides dynamic configuration for networking parameters, Time Zone/Daylight Savings Time
- Configure clocks through provided WinDiscovery software or TELNET
- WinDiscovery tool provides automatic discovery of NTP clocks attached to network without changing PC's network configuration
- Configuration is saved to non-volatile memory
- Password protection prevents unauthorized tampering of clock configuration

Physical

Powder-coated, non-rusting, welded steel chassis

Size:	16.25w x 6.8h x 2.1d in 41.6 w x 17.4h x 5.4d cm	**Weight:**	5.1 lbs 2.3 kg

Connectors

- Ethernet – RJ45
- USB for setup (option)
- 2.1mm locking DC input jack (DC option)

Power

- Power consumption: 15W
- PoE (to IEEE 802.3af standard) or
- **DC option** - includes external AC to DC wall-mount power supply with locking DC plug supplied with your choice of US, Euro, British or AUS/NZ AC power cord – others available

Operating Temperature and Humidity

- Temperature: 0 to +60°C (0 to +40°C, ±1 min/year for standard TCXO)
- Humidity: Up to 90%, non-condensing

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NTP Driven Clock

NTDS 46

2.3” seconds option

FEATURES

- 4" (10.2cm), 6 digit LED
- Display colors available in **red**, **green**, **amber** and **blue**
- Syncs to external or internal NTP source for accurate traceable time
- Display time in 12- or 24-hour format – **hh:mm:ss**
- Display date - **MM:dd:yy** or **dd:MM:yy** or **yy:MM:dd** – configurable
- Adjustable brightness
- All international Time Zones and automatic Daylight Savings Times
- Wireless network available on special order
- Standard chassis color is black powder coat
- PoE, AC or DC input
- CE marked for sale in EU – FCC, Class B, Emissions (pending)

Wall Mount Bracket Included	
Tilt Wall Bracket Option	
Dual Face Ceiling Mount Option	

SPECIFICATIONS

Setup and control software

- Supports DHCP/BOOTP for automatic acquisition of network address, nameservers and time servers
- Provides dynamic configuration for networking parameters, Time Zone/Daylight Savings Time
- Configure clocks through provided WinDiscovery software or TELNET
- WinDiscovery tool provides automatic discovery of NTP clocks attached to network without changing PC’s network configuration
- Configuration is saved to non-volatile memory
- Password protection prevents unauthorized tampering of clock configuration

Physical

Powder-coated, non-rusting, welded steel chassis

Size:	25w x 6.8h x 2.1d in 63.3w x 17.4h x 5.4d cm	**Weight:**	7.6 lbs 3.5 kg

Connectors

- Ethernet – RJ45
- USB for setup (option)
- 2.1mm locking DC input jack (DC option)

Power

- Power consumption: 15W
- PoE (to IEEE 802.3af standard) or
- **AC option** - International 115/230, 50/60 Hz, supplied with your choice of US, Euro, British or AUS/NZ power cord – others available
- **DC option** - includes external AC to DC wall-mount power supply with locking DC plug

Operating Temperature and Humidity

- Temperature: 0 to +60°C
  (0 to +40°C, ±1 min/year for standard TCXO)
- Humidity: Up to 90%, non-condensing

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NTP Driven Clock

NTDS 84

FEATURES

- 7" (18 cm), four-digit LED
- Display colors available in **red**, **green**, **amber** and **blue**
- Syncs to external or internal NTP source for accurate traceable time
- Display time in 12- or 24-hour format – **hh:mm**
- Adjustable brightness
- All international Time Zones and automatic Daylight Savings Times
- Wireless network available on special order
- Standard chassis color is black powder coat
- PoE, or worldwide AC power
- CE marked for sale in EU – FCC, Class B, emissions

Wall Mount Bracket Included	
Tilt Wall Bracket Option	

SPECIFICATIONS

Setup and control software

- Supports DHCP/BOOTP for automatic acquisition of network address, nameservers and time servers
- Provides dynamic configuration for networking parameters, Time Zone/Daylight Savings Time
- Configure clocks through provided WinDiscovery software or TELNET
- WinDiscovery app provides automatic discovery of NTP clocks attached to network without changing PC's network configuration
- Configuration is saved to non-volatile memory
- Password protection prevents unauthorized tampering of clock configuration

Physical

Powder-coated, non-rusting, welded steel chassis

Size:	25.5w x 9.75h x 2.63d in 64.8w x 24.77h x 6.68d cm	**Weight:**	6.2 lbs 2.8 kg

Connectors

- Ethernet – RJ45
- USB for setup (option)
- 2.1mm locking DC input jack (DC option)

Power

- Power consumption: 15W
- PoE (to IEEE 802.3af standard) or
- **AC option** - International 115/230, 50/60 Hz, supplied with your choice of US, Euro, British or AUS/NZ power cord – others available
- **DC option** - includes external AC to DC wall-mount power supply with locking DC plug

Operating Temperature and Humidity

- Temperature: 0 to +60°C
  (0 to +40°C, ±1 min/year for standard TCXO)
- Humidity: Up to 90%, non-condensing

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NTP Driven Clock

NTDS 86

FEATURES

- 7" (18 cm), six-digit LED
- Display colors available in **red**, **green**, **amber** and **blue**
- Syncs to external or internal NTP source for accurate traceable time
- Display time in 12- or 24-hour format – **hh:mm:ss**
- Adjustable brightness; visible from 350 feet (100 meters)
- All international Time Zones and automatic Daylight Savings Times
- Wireless network available on special order
- Standard chassis color is black powder coat
- PoE, or worldwide AC power
- CE marked for sale in EU – FCC, Class B, emissions
- **New! Dry Contact Relay Option –** Upon loss of lock from NTP source NO/NC dry contact relay inside the clock is energized **–** Contact factory

Wall Mount Brackets Included	
Tilt Wall Bracket Option	

SPECIFICATIONS

Setup and control software

- Supports DHCP/BOOTP for automatic acquisition of network address, nameservers and time servers
- Provides dynamic configuration for networking parameters, Time Zone/Daylight Savings Time
- Configure clocks through provided WinDiscovery software or TELNET
- WinDiscovery app provides automatic discovery of NTP clocks attached to network without changing PC's network configuration
- Configuration is saved to non-volatile memory
- Password protection prevents unauthorized tampering of clock configuration

Physical

Powder-coated, non-rusting, welded steel chassis

Size:	25.5w x 9.75h x 2.63d in 64.8w x 24.77h x 6.68d cm	**Weight:**	6.2 lbs 2.8 kg

Connectors

- Ethernet – RJ45
- USB for setup (option)
- 2.1mm locking DC input jack (DC option)

Power

- Power consumption: 15W
- PoE (to IEEE 802.3af standard) or
- **AC option** - International 115/230, 50/60 Hz, supplied with your choice of US, Euro, British or AUS/NZ power cord – others available
- **DC option** - includes external AC to DC wall-mount power supply with locking DC plug

Operating Temperature and Humidity

- Temperature: 0 to +60°C
  (0 to +40°C, ±1 min/year for standard TCXO)
- Humidity: Up to 90%, non-condensing

NTP Digital Clock Display

NTDS 4626

FEATURES

- Time and date display with six 4" (10.2cm) digits on the top row and six - 2.3" (5.8cm) digits on the bottom row
- Display colors available in your choice of red, green, amber, or blue
- Syncs to external or internal NTP source for accurate traceable time
- Display time in 12 or 24 hr format – hh:mm:ss
- Display date in dd:MM:yy, MM:dd:yy, or yy:MM:dd
- Adjustable brightness levels
- All international time zones and automatic daylight saving times
- Standard chassis is brushed stainless steel. Black powder coat is also available
- Power over Ethernet (PoE) or Worldwide AC Power

Rear view

Wall Mount Bracket	

SPECIFICATIONS

Setup and control software

- Supports DHCP/BOOTP for automatic acquisition of network address, nameservers, and time server configuration
- Provides dynamic configuration for networking parameters, time zone/daylight saving time
- Configure clocks through provided WinDiscovery software or TELNET
- WinDiscovery tool provides automatic discovery of NTP clocks attached to network without changing PC's network configuration
- Configuration is saved to non-volatile memory
- Password protection prevents unauthorized tampering of clock configuration

Physical

Powder-coated, non-rusting, welded steel chassis

Size:	25.5w x 10.15h x 2.75d in 64.8w x 25.77h x 7d cm	**Weight:**	9.6 lbs 4.35 kg

Connectors

- Ethernet – RJ45
- USB connector for setup (option)

Power

- Power consumption: 15W
- PoE (to IEEE 802.3af standard) or
- **AC option** - International 115/230, 50/60 Hz, supplied with your choice of US, Euro, British or AUS/NZ power cord – others available
- **DC option** - includes external AC to DC wall-mount power supply with locking DC plug

Operating Temperature and Humidity

- Temperature: 0 to +60°C
  (0 to +40°C, ±1 min/year for standard TCXO)
- Humidity: Up to 90%, non-condensing

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NTP Driven Clocks

NTDS4626-3AL

Stainless Steel Chassis

Black Powder Coat Chassis

FEATURES

- Large time and date display with six 4" digits (10.2cm), six 2.3" digits (5.8cm) and three alphanumeric 2.3" digits (5.8cm)
- Available in any unit combination of **red**, **green**, amber or **blue.**
- Syncs to external or internal NTP source for accurate traceable time
- Display time in 12- or 24-hr formats – hh:mm:ss
- Display date configurable: MM:dd:yy or dd:MM:yy or yy:MM:dd
- Alphanumeric digits may display month or day of week
- Adjustable brightness levels
- All international time zones and automatic daylight saving times
- Wireless network available on special order
- Stainless steel, black, or white powder coat chassis
- Worldwide AC power options

MOUNTING BRACKETS

Wall Mount Bracket Included	

DAY OF WEEK AVAILABLE IN 7 LANGUAGES

English, French, German, Italian, Portuguese, Russian, and Spanish

SPECIFICATIONS

Setup and control software

- Supports DHCP/BOOTP for automatic acquisition of network address, nameservers and time servers
- Provides dynamic configuration for networking parameters, time zone/daylight saving time
- Configure clocks on screen with **WinDiscovery** software or **TELNET**
- Configuration is saved to non-volatile memory
- Encrypted network messages prevent unauthorized tampering of clock configuration

Physical

Powder-coated, non-rusting, welded steel chassis

Size:	25.5w x 10.15h x 2.75d in 64.8w x 25.77h x 7d cm	**Weight:**	9.6 lbs 4.35 kg

Connectors

- RJ45 – Ethernet (and PoE option)
- AC IEC – AC power input

Power

- Power consumption 15W
- AC option - International 90-264 VAC, 47-63 Hz
- Supplied with your choice of US, Euro, British or AUS/NZ power cord – others available
- Power over Ethernet (PoE) option available with all color combinations

Operating Parameters

- Temperature: 0 to +60°C
  (0 to +40°C, ±1 min/year for standard TCXO)
- Humidity: Up to 90%, non-condensing

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NTP Driven Clocks

Model # NTDS8646-SS

FEATURES

- Time and date display with six 7" (*18cm*) digits and six - 4" (*10.2cm*) digits
- Display colors available in **red**, **green**, **amber**, or **blue**
- Syncs to external or internal NTP source for accurate traceable time
- Display time in 12 or 24 hr format – hh:mm:ss
- Display date in dd:MM:yy, MM:dd:yy, or yy:MM:dd
- Adjustable brightness levels
- All international time zones and automatic daylight saving times
- Standard chassis is burnished stainless steel
- Worldwide AC power options

Rear view

SPECIFICATIONS

Setup and control software

- Supports DHCP/BOOTP for automatic acquisition of network address, nameservers, and time server configuration
- Provides dynamic configuration for networking parameters, time zone/daylight saving time
- Configure clocks through provided WinDiscovery software or TELNET
- WinDiscovery provides easy discovery and configuration of NTP clocks attached to the network without changing PC's network configuration
- Configuration is saved to non-volatile memory
- Encrypted network messages prevent unauthorized tampering of clock configuration

Physical

Powder-coated, non-rusting, welded steel chassis

Size:	39.4w x 15h x 2.6d in 100.4w x 38.1h x 6.7d cm	**Weight:**	25 lbs 11.3 kg

Connectors

- Ethernet – RJ45
- Optional AC input - IEC connector

Power

- Power consumption 15W
- AC power - International 90-264 VAC, 47-63 Hz
  - Supplied with your choice of US, Euro, British or AUS/NZ power cord – others available

Operating Temperature and Humidity

- Temperature: 0 to +60°C
  (0 to +40°C, ±1 min/year for standard TCXO)
- Humidity: Up to 90%, non-condensing

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NTP Analog Clocks

CLKNTD 12

FEATURES

- Uses external (or your own internal) NTP source for accurate time traceable to NIST
- -11.5 to +12 hour, Time Zone offsets in 30-minute increments
- Daylight Savings time - US and Canada standard (others optional)
- Uses standard Ethernet wiring
- Microprocessor controlled stepper motor for reliable, accurate, and quiet operation
- Sweep second hand
- Universal AC input voltage and frequency
- Optional PoE (Power over Ethernet)
- Internal crystal and clock chip
- LED Status Indicator
- Standard chassis color is black. Other colors available with minimum order.

SPECIFICATIONS

Setup and Control Software

Supports DHCP/BOOTP for automatic acquisition of network address, nameservers, and time server configuration

- NTP synchronization options and more
- Provides dynamic configuration for networking parameters, time zone/daylight saving time
- Configure clocks through provided network discovery tool or TELNET
- Network discovery tool provides automatic discovery of NTP clocks attached to network without changing PC's network configuration
- Configuration is saved to non-volatile memory and survives power losses
- Encrypted network messages prevent unauthorized tampering of clock configuration

Operating Parameters

- Temperature: 0 to +50°C
- Humidity: Up to 90% (non-condensing at +25°C)

Physical

- 12.5" (*31.8cm*) round black metal case with polycarbonate lens/crystal, 4.25" (*10.8cm*) high
- Surface / wall mount bracket provided
- Weight – 7.6 lbs (*3.45kg*)
- Optional true 24hr face available
- Optional 12/24hr face available

Power

- 90-265 VAC 50/60 Hz
- IEC AC power connector and cord
- Specify US, UK, EURO, or AUS/NZ plugs
- PoE (Power over Ethernet) option available
  < 12.95W power consumption

Compliance

- CE Marked - available for sale in EU
- FCC, Class B, Emissions

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NTP Analog Clocks

CLKNTD 15

FEATURES

- 14.9” (37.85cm) analog clock
- Uses external (or your own internal) NTP source for accurate time traceable to NIST
- -11.5 to +12 hour, Time Zone offsets in 30-minute increments
- Daylight Savings Time, US and Canada standard (others optional)
- Uses standard Ethernet wiring
- Microprocessor controlled stepper motor for reliable, accurate, and quiet operation
- Sweep second hand
- Universal AC input voltage and frequency
- Optional PoE (Power over Ethernet)
- Internal crystal and clock chip
- LED status indicator
- Standard chassis colors are black and stainless steel. Other colors available with minimum order.
- 12/24 hour, true 24 hour and Arabic faces also available

CE

SPECIFICATIONS

Setup and Control Software

- Supports DHCP/BOOTP for automatic acquisition of network address, nameservers, and time server configuration
- NTP synchronization options and more
- Provides dynamic configuration for networking parameters, Ttime Zone/Daylight Savings Time
- WinDiscovery provides automatic discovery of NTP clocks attached to network without changing PC’s network configuration
- Configure clocks through provided WinDiscovery, network discovery app or TELNET
- Configuration is saved to non-volatile memory and survives power losses
- Password-protected and authenticated network messages prevent unauthorized tampering of clock configuration

Operating Parameters

- Temperature: 0 to +50°C
- Humidity: Up to 90% (non-condensing at +25°C)

Physical

- 14.9” (37.85cm) round black metal case with polycarbonate lens/crystal, 4.075” (10.35cm) high
- Surface / wall mount bracket provided
- Weight: 6.2.6 lbs (2.81kg)
- Optional true 24hr face available
- Optional 12/24hr face available

Power

- 90-265 VAC 50/60 Hz
- IEC AC power connector and cord
- Specify US, UK, EURO, or AUS/NZ plugs
- PoE (Power over Ethernet) option available
  < 12.95W power consumption

Compliance

- CE Marked - available for sale in EU
- FCC, Class B, emissions

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NTP Analog Clocks

CLKNTD 18-SS

FEATURES

- Large 18” (40cm) analog clock
- Uses external (or your own internal) NTP source for accurate time traceable to NIST
- -11.5 to +12 hour, Time Zone offsets in 30-minute increments
- Daylight Savings Time, US and Canada standard (others optional)
- Uses standard Ethernet wiring
- Microprocessor controlled stepper motor for reliable, accurate, and quiet operation
- Sweep second hand
- Universal AC input voltage and frequency
- Optional PoE (Power over Ethernet)
- Internal crystal and clock chip
- LED status indicator
- Standard chassis colors are black and stainless steel. Other colors available with minimum order.
- 12/24 hour, true 24 hour and Arabic faces also available

CE

SPECIFICATIONS

Setup and Control Software

- Supports DHCP/BOOTP for automatic acquisition of network address, nameservers, and time server configuration
- NTP synchronization options and more
- Provides dynamic configuration for networking parameters, Time Zone/Daylight Savings Time
- WinDiscovery provides automatic discovery of NTP clocks attached to network without changing PC’s network configuration
- Configure clocks through provided WinDiscovery, network discovery app or TELNET
- Configuration is saved to non-volatile memory and survives power losses
- Password-protected and authenticated network messages prevent unauthorized tampering of clock configuration

Operating Parameters

- Temperature: 0 to +50°C
- Humidity: Up to 90% (non-condensing at +25°C)

Physical

- 18” (45cm) round stainless steel case with polycarbonate lens/crystal, 4.075” (10.35cm) high
- Surface / wall mount bracket provided
- Weight: 11.4 lbs (5.1kg)
- Optional 24hr face available
- Optional tick mark face available

Power

- 90-265 VAC 50/60 Hz
- IEC AC power connector and cord
- Specify US, UK, EURO, or AUS/NZ plugs
- PoE (Power over Ethernet) option available
  < 12.95W power consumption

Compliance

- CE Marked, available for sale in EU
- FCC, Class B, emissions

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NTP Analog Clocks

CLKNTD 30

FEATURES

- 30” (76cm) burnished stainless steel clock
- Uses external (or your own internal) NTP source for accurate time traceable to NIST
- -11.5 to +12 hour, Time Zone offsets in 30-minute increments
- Daylight Savings Time, US and Canada standard (others optional)
- Uses standard Ethernet wiring
- Microprocessor controlled stepper motor for reliable, accurate, and quiet operation
- Sweep second hand
- Universal AC input voltage and frequency
- Optional PoE (Power over Ethernet)
- Internal crystal and clock chip
- LED status indicator
- Standard chassis color is stainless steel. Other colors available with minimum order.
- 12/24 hour, true 24 hour and Arabic faces also available

CE

SPECIFICATIONS

Setup and Control Software

- Supports DHCP/BOOTP for automatic acquisition of network address, nameservers, and time server configuration
- NTP synchronization options and more
- Provides dynamic configuration for networking parameters, Time Zone/Daylight Savings Time
- WinDiscovery provides automatic discovery of NTP clocks attached to network without changing PC’s network configuration
- Configure clocks through provided WinDiscovery, network discovery app or TELNET
- Configuration is saved to non-volatile memory and survives power losses
- Password-protected and authenticated network messages prevent unauthorized tampering of clock configuration

Operating Parameters

- Temperature: 0 to +50°C
- Humidity: Up to 90% (non-condensing at +25°C)

Physical

- 30” (76cm diameter), 3.3” (8.38cm) deep with flat acrylic UV stable lens/crystal
- Surface / wall mount bracket provided
- Weight: 11.4 lbs (5.1kg)
- Optional 24hr face available
- Optional tick mark face available

Power

- 90-265 VAC 50/60 Hz
- IEC AC power connector and cord
- Specify US, UK, EURO, or AUS/NZ plugs
- PoE (Power over Ethernet) option available
  < 12.95W power consumption

Compliance

- CE Marked, available for sale in EU
- FCC, Class B, emissions

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NTP Dual Face Clocks

SPECS

Digital Clocks – 4 Digit

NTDS24DF	**Size:**	10.3w x 7h x 3.5d in 25.9w x 17.8h x 8.4d cm	**Weight:**	4 lbs 1.8 kg
NTDS44DF	**Size:**	15.75w x 9.5h x 3.5d in 40w x 24h x 9d cm	**Weight:**	8.6 lbs 3.9 kg
NTDS84DF*	**Size:**	26w x 10h x 4.5d in 66w x 25.4h x 11.4 cm	**Weight:**	11.7 lbs 5.3 kg

Digital Clocks - 6 Digit

NTDS26DF	**Size:**	15.5w x 7h x 3.5d in 39.5w x 18h x 9d cm	**Weight:**	6 lbs 2.7 kg
TCDS26DF	**Size:**	15.5w x 7h x 3.5d in 39.5w x 18h x 9d cm	**Weight:**	6 lbs 2.7 kg
NTDS46DF	**Size:**	25w x 9.5h x 3.5d in 64w x 24.1h x 9d cm	**Weight:**	11.5 lbs 5.2 kg
NTDS86DF	**Size:**	38w x 10h x 4.5d in 96.5w x 25.4h x 11.4 cm	**Weight:**	20 lbs 9.1 kg

Analog Clocks

CLKNTD12	**Size:**	12.5 dia. x 6 depth in 31.8 dia. x 15.2 depth cm	**Weight:**	11 lbs 5 kg
CLKTCD12	**Size:**	12.5 dia. x 6 depth in 31.8 dia. x 15.2 depth cm	**Weight:**	11 lbs 5 kg

*Availability subject to minimum order of 25.

Up/Down Timer Controller

Model # RC 500

The RC500 is a remote control that adds count down and count up timer control features to our NTDS and TCDS clocks. Uses **WinDiscovery** software (included).

FEATURES

- Clock
- Count down/count up timer (stopwatch or limit)
- Illuminated buttons indicate function currently in use
- Six-digit LED display shows the display on the remote clock(s)
- Controls one or multiple clocks (up to 6 Time Code, unlimited NTP)simultaneously for like events (up/down, starting and stopping simultaneously)
- Ethernet network communication to NTDS clocks
- RS485 communication to TCD clocks
- Power over Ethernet (PoE) option

SPECIFICATIONS

Controls

- Illuminated buttons for Mode Select (count up, count down, clock) and Action (start/pause/reset)

Output

- Ethernet timer control packets for NTDS clocks
- RS485 serial output for Time Code clocks

Physical

- Rubber feet for tabletop use
- Stainless steel or black powder coat chassis
- 6.82w x 5.24h x 2.37d in (17.32w x 13.31h x 6.02) cm

Power Options

- AC input (100 - 240 VAC, 50/60 Hz) Standard
- PoE input (48 VDC, IEEE 802.3af) Standard

Interface

- RJ45 (Ethernet)
- RJ12 (RS485)
- SMA RF Antenna option

Compliance

- CE Marked - Available for sale in EU
- FCC, Class B Part 15, Emissions

Operating Parameters

- Temperature: 0 to +40°C
- Humidity: Up to 90% (non-condensing at +25°C)

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Time Code Driven Clocks

TCD200

IEEE Standard 1344 - Compliant

Reads and displays year and date/time information in IRIG-B control bits.

FEATURES

- Six digits, 0.6 inch (1.5 cm) tall, seven-segment LEDs available in **red**, **green**, **blue** and **amber**
- Syncs to IRIG-B, SMPTE and EBU (also 24 fps film and drop frame) Time Codes
- 24- or 12-hour time display – PM indicator
- Time display: **hh:mm:ss**
- Date display: **MM:dd:yy** - or - **dd:MM:yy** – internal switch configurable
- -11.5 to +12 hour, Time Zone offsets in 30-minute increments
- Daylight Savings Time: US and Canada standard
- Brightness control: 4 levels, switch configurable
- All functions are controllable via RS-232
- Automatic input level control
- Automatic Time Code type detection
- With loss of Time Code unit will revert to internal clock until Time Code is regained and then automatically re-sync to Time Code when available

SPECIFICATIONS

Counter Mode

- Up/down counter mode: start count is initiated with closure between two contacts on DB-9 connector

Connectors

- Time Code input: BNC
- DC input connector: 2.1 mm male DC power plug
- DB-9 male, RS-232 control, counter start/stop contacts (not compatible with RC500)

Operating Parameters

- Temperature: 0 to +40°C
- Humidity: Up to 90% (non-condensing at +25°C)

Rack Mountable

- Optional rack mount kit is available: RM4

Physical

Size: 4.2w x 1.5h x 5.5d in (10.6w x 3.8h x 14d cm)

Wt: 16 oz (435 g)

Power

- 12-28 VDC input
- Wall mounted 12-VDC power supply provided
- 120/240 VAC, please specify: US, EURO, UK or AUS power plug
- Power consumption: < 5W

Power supply has UL, CSA, IEC, EN, VDE and CE approval

Compliance

- CE marked, available for sale in EU
- FCC, Class B, emissions

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Rack Mount Time Code Clock

TCDS16

FEATURES

- 1” (2.54cm), 6 digit LED – display colors available in **amber**, **blue**, **red** and **green**
- Automatically detects and syncs to **IRIG-B** or **SMPTE**, **EBU** non-drop frame time codes
- Six-digit time display in 12- or 24-hour format or date
- All international time zones and automatic daylight saving times
- Standard chassis color is black powder coat; other colors available
- Universal worldwide AC power
- Count down or count up capable (using RC500)
- CE marked for sale in EU – FCC, class B, emissions (pending)

SWIVEL BRACKET OPTION AVAILABLE

SPECIFICATIONS

Setup and Control Software

- Configure clocks through USB serial interface
- Configuration utility running under Microsoft Windows Operating Systems XP or better
- World-wide time zone and DST support– no configuration switches
- Up/down timer mode – controlled with RC500 via RS-485 port
- Configuration is saved to non-volatile memory and survives power losses

Standard Rack Mount – 1RU – “Ears” removable

Size:	16.9w x 1.7h x 4.5d	in	**Weight:**	1.0	lb
	43w x 4.31h x 11.5d	cm		0.45	kg

Operating Limitations

- Temperature: 0 to +60°C
- Humidity: Up to 90% (non-condensing)

Connectors

- BNC female – Unbalanced TC input
- Terminal block – 3 position, balanced TC input
- USB connector for setup
- Small IEC connector (320-6)

Power

- Power consumption < 15W
- International 115/230, 50/60 Hz
- Supplied with choice of US, Euro, British or AUS/NZ power cord – others available

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Rack Mount Time Code Clock

TCDS19

FEATURES

- 1” (2.54cm), 9-digit LED – display colors available in **amber**, **blue**, **red** and **green**
- Automatically detects and syncs to **IRIG-B** or **SMPTE**, **EBU** non-drop frame time codes
- Nine-digit time display in 12- or 24-hour format with day of year
  doy hh:mm:ss
- All international time zones and automatic daylight saving times
- Standard chassis color is black powder coat; other colors available
- Universal worldwide AC power
- Count down or count up capable (using RC500)
- CE marked for sale in EU – FCC, class B, emissions (pending)

SWIVEL BRACKET OPTION AVAILABLE

SPECIFICATIONS

Setup and Control Software

- Configure clocks through USB serial interface
- Configuration utility running under Microsoft Windows Operating Systems XP or better
- World-wide time zone and DST support– no configuration switches
- Up/down timer mode – controlled with RC500 via RS-485 port.
- Configuration is saved to non-volatile memory and survives power losses

Standard Rack Mount – 1RU – “Ears” removable

Size:	16.9w x 1.7h x 4.5d	in	**Weight:**	1.0	lb
	43w x 4.31h x 11.5d	cm		0.45	kg

Operating Limitations

- Temperature: 0 to +60°C
- Humidity: Up to 90% (non-condensing)

Connectors

- BNC female – Unbalanced TC input
- Terminal block – 3 position, balanced TC input
- USB connector for setup
- Small IEC connector (320-6)

Power

- Power consumption < 15W
- International 115/230, 50/60 Hz
- Supplied with choice of US, Euro, British or AUS/NZ power cord – others available

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Rack Mount Time Code Clock

TCDS112

FEATURES

- 1” (2.54cm), 12-digit LED – Display colors available in **amber**, **blue**, **red** and **green**
- Automatically detects and syncs to **IRIG-B** or **SMPTE**, **EBU** non-drop frame time codes
- Two 6-digit displays to show time and date (mm:dd:yy hh:mm:ss)
- All international time zones and automatic daylight saving times
- Standard chassis color is black powder coat; other colors available
- Universal worldwide AC power
- Count down or count up capable (using RC500)
- CE marked for sale in EU – FCC, class B, emissions (pending)

SWIVEL BRACKET OPTION AVAILABLE

SPECIFICATIONS

Setup and Control Software

- Configure clocks through USB serial interface
- Configuration utility running under Microsoft Windows Operating Systems XP or better
- World-wide time zone and DST support– no configuration switches
- Up/down timer mode – controlled with RC500 via RS-485 port
- Configuration is saved to non-volatile memory and survives power losses

Standard Rack Mount – 1RU – “Ears” removable

Size:	16.9w x 1.7h x 4.5d	in	**Weight:**	1.0	lb
	43w x 4.31h x 11.5d	cm		0.45	kg

Operating Limitations

- Temperature: 0 to +60°C
- Humidity: Up to 90% (non-condensing)

Connectors

- BNC female – Unbalanced TC input
- Terminal block – 3 position, balanced TC input
- USB connector for setup
- Small IEC connector (320-6)

Power

- Power consumption < 15W
- International 115/230, 50/60 Hz
- Supplied with choice of US, Euro, British or AUS/NZ power cord – others available

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Time Code Driven Clock

TCD 24

FEATURES

TCD24
Masterclock
TIME CODE INPUT
DC IN 12 - 28 VDC
MASTERCLOCK, INC. 2484 W. CLAY ST. ST. CHARLES, MO. 63301 +800-940-2248 MADE IN USA

- Four 2.3" (5.8cm), seven-segment LEDs
- Display colors available in **red**, **green**, **amber** and **blue**
- Syncs to IRIG-B and SMPTE, EBU non-drop frame Time Codes
- Automatic Time Code type detection and input level control
- Display time in 12- or 24-hr format – **hh:mm**
- Display date **MM-dd** or **dd-MM**
- Brightness control: 8 levels, switch configurable
- -11.5 to +12 hour, Time Zone offsets in 30-minute increments
- Daylight Saving Time: US & Canada standard; others on special order
- Standard chassis color is black powder coat

Wall Mount Bracket	

SPECIFICATIONS

Internal Clock

- With loss of Time Code The TCD24 will revert to internal RTC until Time Code is regained and then automatically re-syncs to Time Code when available

Physical

Size:	9.4w x 3h x 4d in 23.9w x 7.6h x 4.1d cm	**Weight:**	1.4 lbs 0.6 kg

Chassis

- Chassis is non rusting steel with removable back
- Black powder coat painted inside and out
- Configuration switches accessible by removing 4 screws and rear cover

Operating Parameters

- Temperature: 0 to +40°C
- Humidity: Up to 90% (non-condensing at +25°C)

Connectors

- Time Code input - BNC
- DC input connector is 2.1 mm female DC power plug

Power

- Input voltage 12-28 VDC
- Power consumption: <5 watts
- External wall mount PS is supplied. Please specify 120 or 220 VAC and type of power plug (country type)
- Power components have UL, CSA, IEC, EN, VDE and CE approval

IEEE Standard 1344 - Compliant

Reads and displays year and date/time information in IRIG-B control bits.

Masterclock, Inc.

phone (USA and Canada): 1-800-940-2248 | phone (international): +1-636-724-3666
email: sales@masterclock.com | online: www.masterclock.com

Time Code Driven Clock

TCD 26

FEATURES

- 2.3" (5.8cm), 6 digit LED – display colors available in **red**, **green**, **amber** or **blue**
- Syncs to IRIG-B and SMPTE, EBU non-drop frame Time Codes
- Automatic Time Code type detection and input level control
- Display time in 12- or 24-hr format – **hh:mm:ss**
- Display date **MM-dd-yy** or **dd-MM-yy** – switch configurable
- Brightness control: 4 levels – switch configurable
- -11.5 to +12 hour, Time Zone offsets in 30-minute increments
- DaylightSavings Time – US & Canada standard; others available on special order
- All functions controllable via RS-232 port

SPECIFICATIONS

Internal Clock

- With loss of Time Code will revert to internal clock until Time Code is regained

Counter Mode

- Up/down counter mode – controlled with RC500 or RS232 serial port

Chassis

- Chassis is non-rusting steel with removable top
- Black powder coat painted inside and out
- Configuration switches accessible by removing four screws and rear cover

Connectors

- Time Code input: BNC
- DC input: 2.1 mm male DC power plug

Size: 19w x 3.5h x 6.25d in
48.3w x 8.9h x 16.5d cm

Weight: 8.2 lbs
3.7 kg

Power

- Power input: 90-264 VAC, 47-63 Hz, universal
- 12-28 VDC input can be used as floating backup power supply or as primary power input
- Power consumption: <10W
- Power supply has UL, CSA, IEC, EN, VDE & CE approval

Compliance

- CE Marked, available for sale in EU
- FCC, Class B, emissions

Operating Parameters

- Temperature: 0 to +40°C
- Humidity: Up to 90% (non-condensing at +25°C)

IEEE Standard 1344 - Compliant

- Reads and displays year and date/time information in IRIG-B control bits.
- 0% (non-condensing at +25°C)

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Time Code Driven Clock

TCDS 26

Features

- 2.3” (5.68cm), six-digit LEDs available in **red**, **green**, **amber** or **blue**
- Automatically detects and syncs to IRIG-B or SMPTE, EBU non-drop frame Time Codes
- Six-digit time display in 12- or 24-hour format – **hh:mm:ss**
- All international Time Zones and automatic Daylight Saving Times
- Standard chassis color is black powder coat
- Worldwide AC Power
- Count-down or count-up time modes
- CE marked for sale in EU – FCC, Class B, Emissions

MOUNTING BRACKETS

Rack Mount Bracket for 19” 2U Rack -or- Wall Mount Bracket	
Tilt Wall Bracket Option	

SPECIFICATIONS

- Configure clocks through USB serial interface
- Configuration utility running under Microsoft Windows
- World-wide Time Zone and DST app configuration
- Command line interface (and drivers) for use with Linux, Unix, MAC
- Up/down timer mode controlled with RC500 or USB serial port
- Configuration is saved to non-volatile memory to survive power loss

Physical

Size:	16.9w x 3.43h x 3.0d in 43w x 8.7h x 7.6d cm	Weight:	4.3 lbs 1.95 kg

Operating Parameters

- Temperature: 0 to +60°C
- Humidity: Up to 90% (non-condensing at +25°C)

Connectors

- BNC female: Unbalanced TC input
- Terminal block: 3 position, balanced TC input
- USB connector: for setup
- 2.1 mm male locking DC input jack (DC option)
- IEC connector (AC option)
- RS485 serial for RC500 control (option)

Power

- Power consumption: < 13W
- AC option: International 115/230, 50/60 Hz supplied with choice of US, Euro, British or AUS/NZ power cord – others available
- DC option:
  - VDC input can be used as backup or primary power
  - Includes external AC to DC wall-mount power supply with locking DC plug
  - Supplied with choice of wall transformer US, Euro, British or AUS/NZ plug – others available

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Time Code Driven Clock

TCDS 29

Features

- 1.8” (4.6 cm), nine-digit LED – available in **red**, **green**, **amber** or **blue**
- Automatically detects and syncs to IRIG-B or SMPTE, EBU non-drop frame Time Codes
- Three digit Day of Year display
- Six-digit time display in 12- or 24-hour format – **hh:mm:ss**
- All international Time Zones and automatic Daylight Saving Times
- Standard chassis color is black powder coat
- Worldwide AC Power
- Count-down or count-up time modes
- CE marked for sale in EU – FCC, Class B, Emissions

MOUNTING BRACKETS

Rack Mount Bracket for 19” 2U Rack -or- Wall Mount Bracket	
Tilt Wall Bracket Option	

SPECIFICATIONS

- Configure clocks through USB serial interface
- Configuration utility running under Microsoft Windows
- World-wide Time Zone and DST app configuration
- Command line interface (and drivers) for use with Linux, Unix, MAC
- Up/down timer mode controlled with RC500 or USB serial port
- Configuration is saved to non-volatile memory to survive power loss

Physical

Size:	17.5w x 3.75h x 3.0d in 44.5w x 9.6h x 7.6d cm	Weight:	3.2 lbs 1.4 kg

Operating Parameters

- Temperature: 0 to +40°C
- Humidity: Up to 90% (non-condensing at +25°C)

Connectors

- BNC female: Unbalanced TC input
- Terminal block: 3 position, balanced TC input
- USB connector: for setup
- 2.1 mm male locking DC input jack (DC option)
- IEC connector (AC option)

Power

- Power consumption: <13W
- AC option: International 115/230, 50/60 Hz supplied with choice of US, Euro, British or AUS/NZ power cord – others available
- DC option:
  - VDC input can be used as backup or primary power
  - Includes external AC to DC wall-mount power supply with locking DC plug
  - Supplied with choice of wall transformer US, Euro, British or AUS/NZ plug – others available

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Time Code Driven Clock

TCDS 29

Features

- 1.8” (4.6 cm), nine-digit LED – available in **red**, **green**, **amber** or **blue**
- Automatically detects and syncs to IRIG-B or SMPTE, EBU non-drop frame Time Codes
- Three digit Day of Year display
- Six-digit time display in 12- or 24-hour format – **hh:mm:ss**
- All international Time Zones and automatic Daylight Saving Times
- Standard chassis color is black powder coat
- Worldwide AC Power
- Count-down or count-up time modes
- CE marked for sale in EU – FCC, Class B, Emissions

MOUNTING BRACKETS

Rack Mount Bracket for 19” 2U Rack -or- Wall Mount Bracket	
Tilt Wall Bracket Option	

SPECIFICATIONS

- Configure clocks through USB serial interface
- Configuration utility running under Microsoft Windows
- World-wide Time Zone and DST app configuration
- Command line interface (and drivers) for use with Linux, Unix, MAC
- Up/down timer mode controlled with RC500 or USB serial port
- Configuration is saved to non-volatile memory to survive power loss

Physical

Size:	17.5w x 3.75h x 3.0d in 44.5w x 9.6h x 7.6d cm	Weight:	3.2 lbs 1.4 kg

Operating Parameters

- Temperature: 0 to +40°C
- Humidity: Up to 90% (non-condensing at +25°C)

Connectors

- BNC female: Unbalanced TC input
- Terminal block: 3 position, balanced TC input
- USB connector: for setup
- 2.1 mm male locking DC input jack (DC option)
- IEC connector (AC option)

Power

- Power consumption: <13W
- AC option: International 115/230, 50/60 Hz supplied with choice of US, Euro, British or AUS/NZ power cord – others available
- DC option:
  - VDC input can be used as backup or primary power
  - Includes external AC to DC wall-mount power supply with locking DC plug
  - Supplied with choice of wall transformer US, Euro, British or AUS/NZ plug – others available

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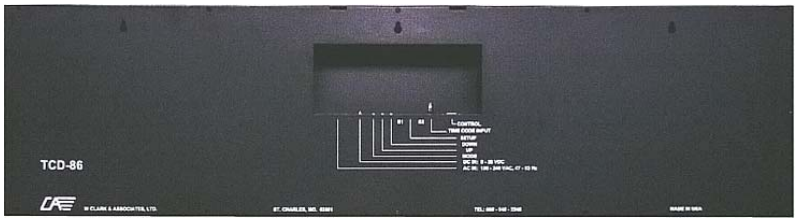
Time Code Driven Clock

TCD 86

FEATURES



- Six 7.1" (18 cm), seven-segment LEDs
- Display colors available in **red**, **green**, **amber** and **blue**
- Syncs to IRIG-B and SMPTE, BU non-drop frame Time Codes
- Automatic Time Code type detection and input level control
- Display time in 12- or 24-hr format – **hh:mm**
- Display date **MM-dd** or **dd-MM**
- Brightness control: 4 levels, switch configurable
- -11.5 to +12 hour, Time Zone offsets in 30-minute increments
- Daylight Savings Time: US & Canada standard; others on special order
- All functions controllable via RS-232 port
- Standard chassis color is black powder coat

3 Wall Mount Brackets

SPECIFICATIONS

Internal Clock

- With loss of Time Code the TCD86 will revert to internal RTC until Time Code is regained

Physical

Size:	46.75w x 12.25h x 4.5d in 119w x 31h x 11.4d cm	**Weight:**	26 lbs 11.8 kg

Chassis

- Chassis is non-rusting steel with removable back
- Black powder coat painted inside and out
- Plexiglas acrylic lens cover
- Up/down counter mode – controlled with RC200 or RS232 serial port

Operating Parameters

- Temperature: 0 to +40°C
- Humidity: Up to 90% (non-condensing at +25°C)

Connectors

- Time Code input: BNC
- DC input connector is 2.1 mm male DC power plug
- AC input IEC connector

Power

- Power input:90-264 VAC, 47-63 Hz, universal
- 12-28 VDC input can be used as floating backup power supply or as primary power input
- Power consumption <30W
- External wall mount PS is supplied. Please specify 120 or 220 VAC and type of power plug (country type)
- Power components have UL, CSA, IEC, EN, VDE and CE approval

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Time Code Analog Clocks

CLKTCD 12

FEATURES

- SMPTE, EBU and IRIG-B (modulated and unmodulated) Time Code driven
- Self-correcting to non-drop frame Time Code
- -11.5 to +12 hour, Time Zone offsets in 30-minute increments
- Daylight Savings Time, US and Canada standard (others optional)
- Microprocessor controlled stepper motor for reliable, accurate and quiet operation
- Sweep second hand
- Universal AC input voltage and frequency
- Fully configurable via USB interface with supplied CLKSET software
- Standard chassis colors available are black or beige (off-white) powder coat
- Other colors available with minimum order, contact factory for details

SPECIFICATIONS

Inputs

- Time Code input via BNC
- Optional twisted pair to BNC adapter available for Time Code input: specify BNC-pigtail
- Time Zone offset and other setup switches accessible on back panel

Physical

- Size: 12.5” (31.8cm) round black metal case with polycarbonate lens/crystal, 4.25” (10.8cm) high
- Surface/wall mount bracket provided
- Weight:7.6 lbs (3.45kg)
- Optional true 24-hour face available
- Optional 12/24-hour face available

Power

- 90-265 VAC 50/60 Hz
- IEC AC power connector and cord
- Specify US, UK, EURO or AUS/NZ plugs
- DC option also available

Compliance

- CE Marked, available for sale in EU
- FCC, Class B, emissions

Operating Parameters

- Temperature: 0 to +50°C
- Humidity: Up to 90% (non-condensing at +25°C)

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Time Code Analog Clocks

CLKTCD 15

FEATURES

- 14.9” (37.85cm) analog clock
- SMPTE, EBU and IRIG-B (modulated and unmodulated) Time Code driven
- Self-correcting to non-drop frame Time Code
- -11.5 to +12 hour, Time Zone offsets in 30-minute increments
- Daylight Savings Time: US and Canada standard (others optional)
- Microprocessor controlled stepper motor for reliable, accurate, and quiet operation
- Sweep second hand
- Universal AC input voltage and frequency
- Fully configurable via USB interface with supplied CLKSET software
- Standard chassis colors available are black or beige (off-white) powder coat
- Other colors available with minimum order – contact factory for details

SPECIFICATIONS

Inputs

- Time Code input via BNC
- Optional twisted pair to BNC adapter available for Time Code input: specify BNC-pigtail
- Time Zone offset and other setup switches accessible on back panel

Physical

- 14.9” (37.85cm) round black metal case with polycarbonate lens/crystal, 4.25” (10.8cm) high
- Surface/wall mount bracket provided
- Weight : 6.2 lbs (2.81kg)
- Optional true 24-hour face available
- Optional 12/24-hour face available

Power

- 90-265 VAC 50/60 Hz
- IEC AC power connector and cord
- Specify US, UK, EURO, or AUS/NZ plugs
- DC option also available

Compliance

- CE Marked, available for sale in EU
- FCC, Class B, emissions

Operating Parameters

- Temperature: 0 to +50°C
- Humidity: Up to 90% (non-condensing at +25°C)

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Time Code Analog Clocks

CLKTCD 18

FEATURES

- 18” (45cm) analog clock
- SMPTE, EBU and IRIG-B (modulated and unmodulated) Time Code driven
- Self-correcting to non-drop frame time code
- -11.5 to +12 hour, Time Zone offsets in 30-minute increments
- Daylight Savings Time: US and Canada standard (others optional)
- Microprocessor controlled stepper motor for reliable, accurate, and quiet operation
- Sweep second hand
- Universal AC input voltage and frequency
- Fully configurable via USB interface with supplied CLKSET software
- Standard chassis colors available are black or beige (off-white) powder coat
- Other colors available with minimum order – contact factory for details

SPECIFICATIONS

Inputs

- Time Code input via BNC
- Optional twisted pair to BNC adapter available for Time Code input, specify BNC-pigtail
- Time Zone offset and other setup switches accessible on back panel

Physical

- 18” (37.85cm) round black metal case with polycarbonate lens/crystal, 4.25” (10.8cm) high
- Surface/wall mount bracket provided
- Weight: 11.4 lbs (5.1kg)
- Optional true 24-hour face available
- Optional 12/24-hour face available

Power

- 90-265 VAC 50/60 Hz
- IEC AC power connector and cord
- Specify US, UK, EURO, or AUS/NZ plugs
- DC option also available

Compliance

- CE marked, available for sale in EU
- FCC, Class B, emissions

Operating Parameters

- Temperature: 0 to +50°C
- Humidity: Up to 90% (non-condensing at +25°C)

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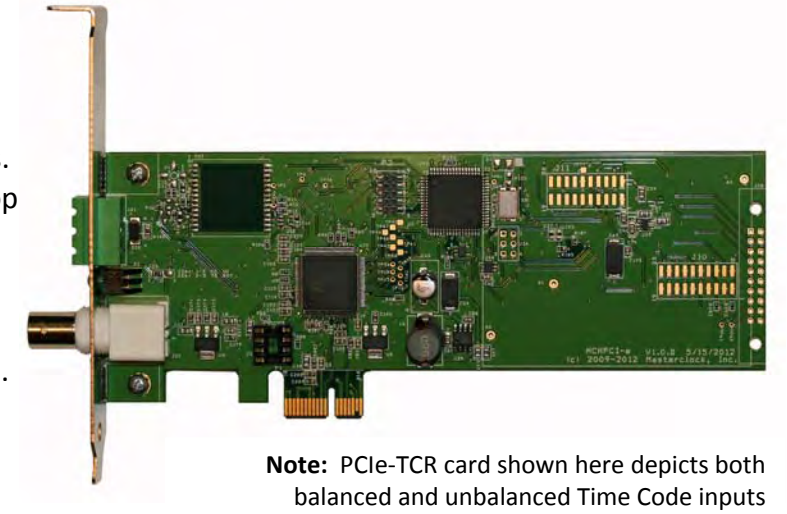
PCIe with Time Code Reference Input

PCIe-TCR

PCIe-TCR card references Time Code sources. Accepts time code formats: SMPTE (Non-Drop Frame), EBU, NDF and IRIG-B0 and -B1

Increase long-term accuracy and holdover with an **HSO (high stability oscillator)** option.



Note: PCIe-TCR card shown here depicts both balanced and unbalanced Time Code inputs

FEATURES

- Accepts time code formats: SMPTE 24fps (Film), 25fps (EBU), 30fps NDF (Non-Drop Frame) and IRIG-B0 (unmodulated/pulse width modulated) and IRIG-B1 (amplitude modulated, 1kHz)
- Provides millisecond accuracy to applications in Windows environments
- Microsecond accuracy achievable through API development
- Automatic daylight saving time and date
- Software runs under Windows XP, 7 and Server 2003/2008 SP1 version, all in both 32- and 64-bit
- Onboard long-life battery for real time clock retention
- PCIe revision 2.0 – slot compatible X1 through X32
- LED status indicator
- API software development kit and documentation is provided for designers
- Automatic Time Code detection and gain control

SPECIFICATIONS

Physical

- Low profile card and bracket standard
- Length = 6.6" (167.6 mm)
- Height = 2.712" (68.8 mm)
- Full height bracket also available

Certifications

- CE / FCC and RoHS Compliant

Options

- HSO level 1 and 2 upgrades
- PCIe Sync-NTP software provides NTP reference for heterogeneous systems or LAN

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PCIe with GPS Reference

Model # PCIe-GPS

The Masterclock **PCIe-GPS card** receives reference time from atomic clocks orbiting in GPS (Global Positioning System) satellites to provide the most accurate time and date information for a Windows PC. See the User Manual for additional GPS information available through API.

Increase long-term accuracy and holdover with a **HSO (high stability oscillator)** option.

FEATURES

- Provides millisecond accuracy to applications in Windows environments
- Microsecond accuracy achievable through API development
- Automatic daylight saving time and date
- Software runs under Windows XP, 7 and Server 2003/2008 SP1 version, all in both 32- and 64-bit
- Onboard long-life battery for real time clock retention
- PCIe revision 2.0 – slot compatible X1 through X32
- LED status indicator
- API software development kit and documentation is provided for designers

SPECIFICATIONS

Physical

- Low profile card and bracket standard
- Length = 6.6" (167.6 mm)
- Height = 2.712" (68.8 mm)
- Full height bracket also available

Certifications

- CE / FCC and RoHS Compliant

Options

- HSO level 1 and 2 upgrades
- PCIe Sync-NTP software provides NTP reference for heterogeneous systems or LAN
- Basic magnetic and standard hard mount antennas
- Antenna cable lengths up to 500’ (150m)

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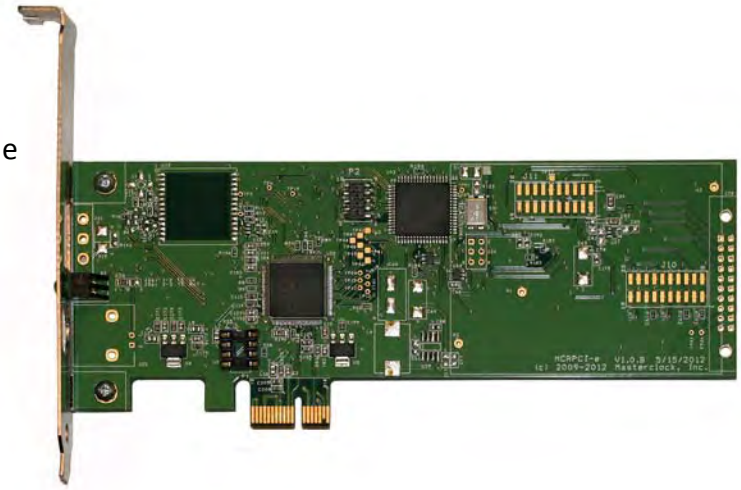
PCIe with Internal Oscillator

PCIe-OSC



PCIe-OSC card provides very stable, accurate time and date information for a Windows PC.

Configuration options include **GPS** or **Time Code** inputs.

Increase long-term accuracy and holdover with an **HSO (high stability oscillator)** option.

FEATURES

- Provides millisecond accuracy to applications in Windows environments
- Microsecond accuracy achievable through API development
- API software development kit and documentation is provided for designers
- Automatic daylight saving time and date
- Software runs under Windows XP, 7 and Server 2003/2008 SP1 version, all in both 32- and 64-bit
- Onboard long-life battery for real time clock retention
- PCIe revision 2.0 – slot compatible X1 through X32
- LED status indicator

SPECIFICATIONS

Physical

- Low profile card and bracket standard
- Length = 6.6" (167.6 mm)
- Height = 2.712" (68.8 mm)
- Full height bracket also available

Certifications

- CE / FCC and RoHS Compliant

Options

- HSO level 1 and 2 upgrades
- PCIe Sync-NTP software provides NTP reference for heterogeneous systems or LAN

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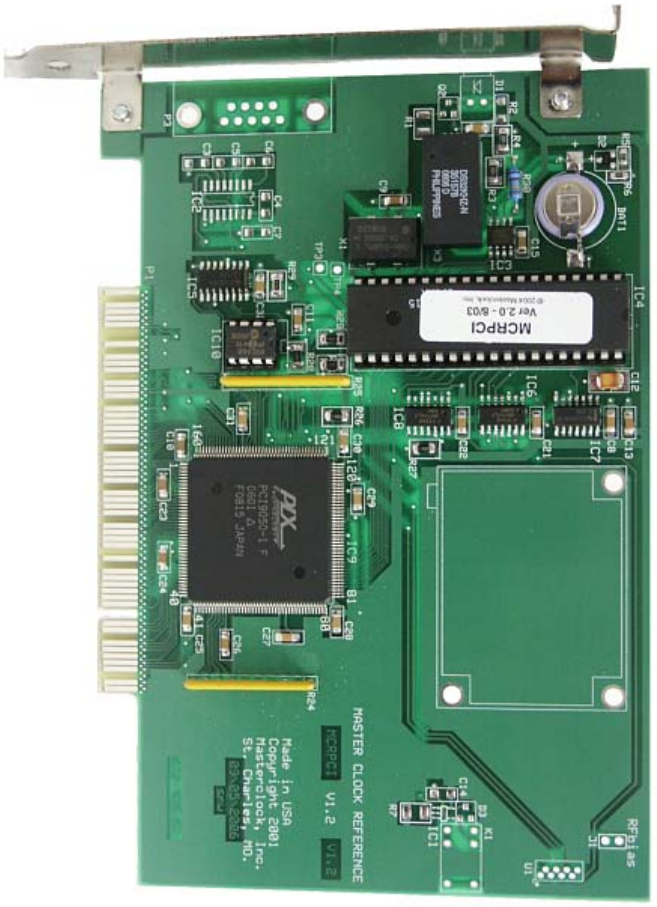
PC Cards

MCR-PCI Real Time Clock Card

Our master clock reference (MCR) is a PCI card that provides very stable accurate time and date information for a Windows PC. The card uses a Real Time Clock (RTC) chip and oscillator with temperature compensation to stabilize the PC clock. The MCR maintains PC accuracy to 165 mSec per day, or 1 minute per year. The onboard clock runs from a backup battery in the absence of power from the PC.



FEATURES

- Accurate clock reference for PCs
- Provide millisecond accuracy to applications and automation systems
- Supplied with software to allow user to set the card which then sets the PC clock
- Ability to update from stable external time source using DLLs and APIs for custom programming; includes sample source code
- Real Time Clock chip & oscillator with temperature compensation
- Drivers and APIs included for Windows 98/ME/NT/2000 and XP
- Stability of ± 165 ms per day

SPECIFICATIONS

Software Included

- Device driver
- DLL with documented API
- MCRSET utility permits directly viewing, setting, and comparing time
- MCRSYNC service automatically keeps PC clock synchronized

MCRPCI Configuration

- Automatic port and interrupt selection (plug and play compatible)

Operating Temperatures

- Temperature: 0 to +60°C

Physical

- One-third slot PCI card
- Long life battery on board runs clock when PC is powered off
- Accurate to ±1 minute/year at 0°C-40°C

Data Available

- Time in hours, minutes, seconds, milliseconds with precision time stamp available

Masterclock, Inc.

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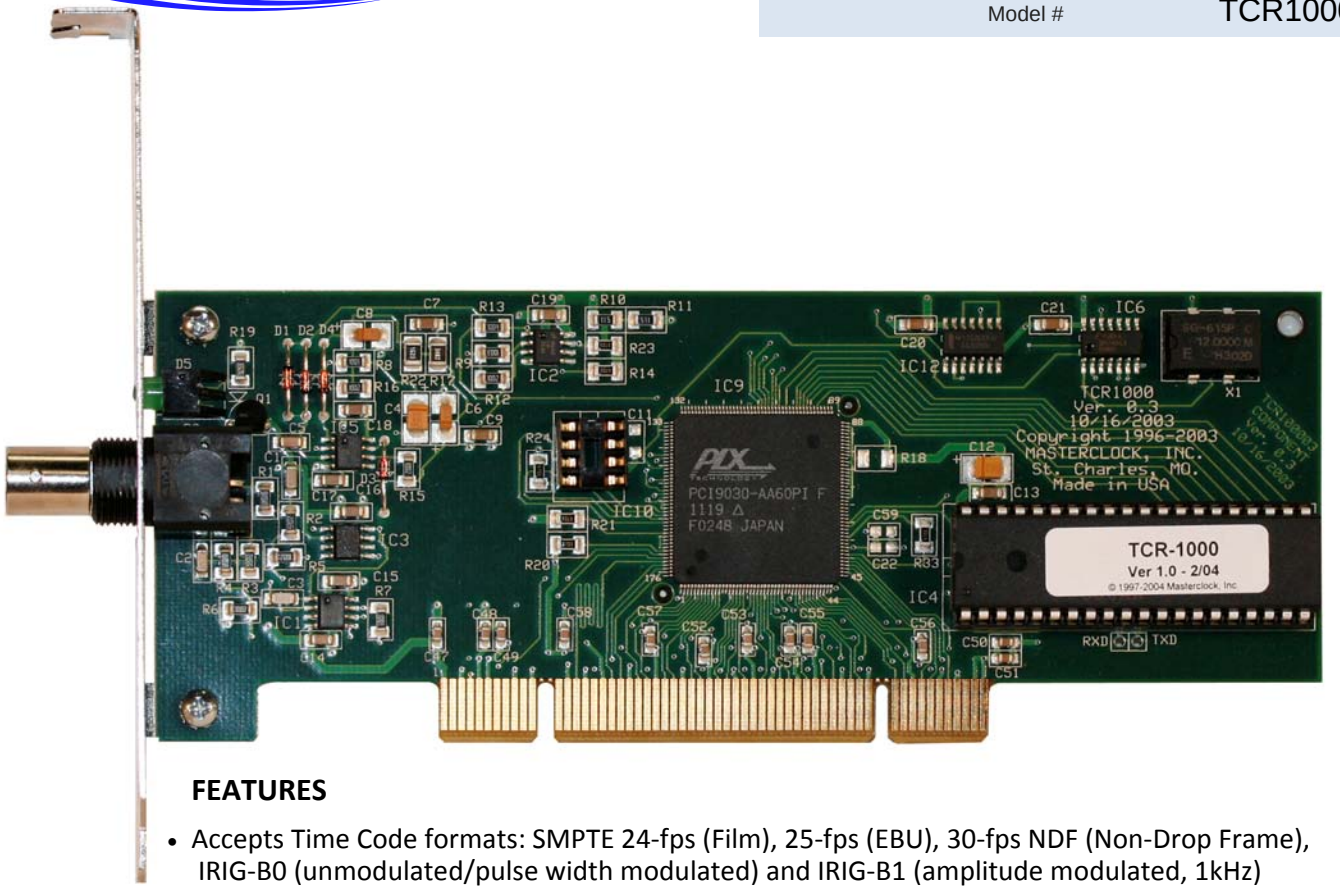
Time Code Reader

Model # TCR1000



FEATURES

- Accepts Time Code formats: SMPTE 24-fps (Film), 25-fps (EBU), 30-fps NDF (Non-Drop Frame), IRIG-B0 (unmodulated/pulse width modulated) and IRIG-B1 (amplitude modulated, 1kHz)
- Allows millisecond synchronization accuracy
- Automatic Daylight Savings Time and date
- TCRSync1000 software that runs as a service providing additional diagnostics and other benefits under Windows XP/7/Server 2003 and 2008-SP1
- Optional software – TCRSync-NTP provides NTP reference for heterogeneous operating systems on an Ethernet LAN
- API software development kit and documentation is provided for designers

SPECIFICATIONS

Connector

- BNC connector for Time Code input
- Optional three pin positive locking, right angle pin header (0.1" pin spacing) for Time Code input

Physical

- Half- height card
- Length: 6.6" (167.6 mm)
- Height : 2.5" (63.6 mm)

Other features

- LED status indicator
- Universal 32-bit/33 MHz or 64-bit bus
- 3.3V and 5V universal card
- Operates in higher speed and wider buses
- Detects Time Code type automatically
- Time Code level set automatically
- Software runs as a service under Windows XP/7/Server 2003 and 2008

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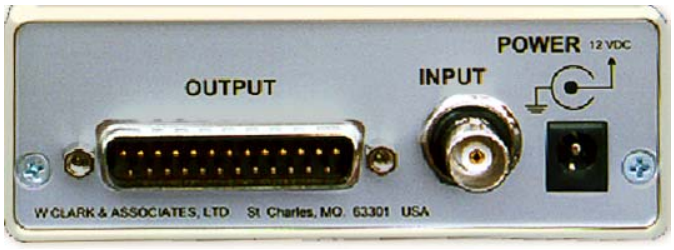
Time Code Interface

TCC 100P



FEATURES

- Converts Time Codes to parallel BCD
- Reads SMPTE (EBU, film & non-drop frames)
- Reads IRIG-B
- Outputs parallel BCD time information
- Output format is directly compatible with **Utah Scientific MC-500 series switchers**
- 120/240 VAC with supplied external wall mounted power supply or
- 12 VDC operation
- Power supplies available for most countries

Rack mountable with an **RM4**

CE

SPECIFICATIONS

I/O Connections

- Input power is 12 VDC via 2.1mm male power connector
- Time Code input: BNC socket
- BCD output : db-25

Operating Parameters

- Temperature: 0 to +70°C
- Humidity: Up to 90% (non-condensing)
- Storage Temperatures: -40° to +70°C

Physical

Size:	4.2w x 1.5h x 5.5d in 10.6w x 3.8h x 14d cm	**Weight:**	16 oz 435 g

Case

- Cover: Off-white aluminum
- Front/rear panel : Clear anodized aluminum
- Optional rack mount kit is available – RM4 (see above)

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Time Code Interface

TCC 500

FEATURES

- Reads SMPTE (including EBU, film & non-drop frame) and IRIG-B
- Outputs parallel BCD time with 8 digit or one millisecond resolution – **hh:mm:ss:ms** (frames)
- 120/240 VAC with supplied external wall mounted power supply or 12-28 VDC operation.
- Power supplies available for most countries throughout the world

CE

Rack mountable with an **RM4**

SPECIFICATIONS

I/O Connections

- Input power: 12 VDC converted from wall mount AC unit 115/230, 50/60 Hz
- 2.1mm male power connector
- Time Code input: BNC socket
- BCD output: DB-37

Operating Parameters

- Temperature: 0 to +70°C
- Humidity: Up to 90%, non-condensing

Physical

Size:	4.13w x 1.5h x 5.5d inches 10.48w x 3.81h x 14d cm	**Weight:**	16 oz 435 g

Case

- Cover: Off-white aluminum
- Front/rear panel: Clear anodized aluminum
- Optional rack mount kit available – RM4

Masterclock, Inc.

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Time Code Interface

TCI 232

Rack mountable with an **RM4**

FEATURES

- Reads SMPTE and EBU Time Codes
- -11 to +12 hour selectable Time Zone offsets
- Automatic Daylight Savings Time adjustments (selectable)
- Time and date information via RS-232 or RS-422
- Time mark pulse output (ttl level) at 1 per: second, minute, hour or day
- Dry contact closure at 1 per: minute, hour or day
- Contact and pulse output can be advanced by 1 second for system re-sync at 59 second point
- Heathkit WWV clock output emulation (for GV switchers)
- Output Time Code as specified with above options

SPECIFICATIONS

I/O Connections

- Time Code input: BNC socket
- RS-232, pulse, contact closure and Time Code output: DB-9 male
- Optional DB-9 to BNC adapter: BNC-9
- Input power is 12 VDC via 2.1mm male power connector converted from wall mount 115/230 VAC, 50/60 Hz

Operating Parameters

- Temperature: 0 to +70°C
- Humidity: Up to 90%, non-condensing

Physical

Size:	4.2w x 1.5h x 5.5d in 10.6w x 3.8h x 14 cm	**Weight:**	16 oz 435 g

Case

- Cover: Off-white aluminum
- Front/rear panel: Clear anodized aluminum
- Optional rack mount kit available - RM4

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Time Code Interface

TCI NENA

FEATURES

- Generates signals for NENA/PSAP equipment
- Operate from IRIG-B or SMPTE Time Code inputs
- IRIG-B modulated or pulse-width encoded Time Code output
- IRIG-E modulated or pulse-width encoded Time Code output
- All Time Code outputs support signature control
- All Time Code outputs encode NENA extensions
- Supports NENA-defined ASCII outputs at 9600, 4800, 2400, and 1200 baud
- Perform Time Zone adjustments in display, serial, and Time Code outputs
- Perform Daylight Savings Time adjustment in display, serial, and Time Code outputs
- Provides dry contact closure alarm for Time Code or power loss

Rack mountable with an **RM4**

SPECIFICATIONS

I/O Connections

- Input power: 12-28 VDC
- 2.1 mm male DC power connector
- Time Code input: BNC socket
- RS-232, pulse, contact closure and Time Code output - DB-9 male
- Optional DB-9 to BNC adapter BNC-9

Operating Parameters

- Temperature: 0 to +70°C
- Humidity: Up to 90%, non-condensing

Physical

Size:	4.2w x 1.5t x 5.5d in 10.6w x 3.8t x 14d cm	**Weight:**	16 oz 435 g

Case

- Cover: off-white aluminum
- Front/rear panel: clear anodized aluminum
- Optional rack mount kit available: RM4

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Time Code Interface

Model # TCA 100

The **TCA100** is a Time Code amplifier designed to isolate and strengthen signals in order to distribute them to multiple feeds over large areas.

FEATURES

- Works with IRIG (all except differential), SMPTE, EBU and others
- Transformer outputs for superior isolation
- BNC I/O connectors for ease of connection
- Balanced I/O available via DB-9 connector
- Two separate and isolated output channels standard

SPECIFICATIONS

Output Level

- Up to 14 V PP (with 600Ω load)
- Each channel is individually adjustable with a front panel accessible level control

Output Options

Each output channel can be jumpered to provide:

- isolated balanced to ground
- single ended grounded
- transformer isolated differential

Input Level

2-14 Vpp range of input for rated output

Frequency Response

100 Hz to 8 kHz ± 1dB

Physical

Size:	4.2w x 1.5h x 5.5d in 10.6w x 3.8h x 14d cm	**Weight:**	16 oz 435 g

Case

- Cover:off-white aluminum, rack-mountable
- Front/rear panel - clear anodized aluminum
- Rack-mountable using RM4 kit

I/O Connectors

- Input is balanced and connected via an isolated BNC or 2 pins of a DB-9 male connector
- Outputs are transformer isolated, balanced and available via isolated BNCs or separate pins of a DB-9 male connector
- Power connector is 2 mm male plug

Power Supply

- Input voltage 12-28 VDC, <1 watt power consumption, external wall mount PS is supplied – please specify 120 or 220 VAC

Operating Parameters

- Temperature: 0 to +70°C
- Humidity: Up to 90% (non-condensing at 25°C)

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Time Code, RF & Pulse Amplifier

DA12

DA12 SPECS

- 2 inputs: 1/12 or 2/6 input/output
- Output banks are selectable AC or DC coupled
- Dual isolated output banks
- Standard chassis color is black powder coat
- Universal worldwide AC power
- CE marked for sale in EU –FCC, class B, emissions (pending)
- Green power LED on front panel

INPUTS - 2

- RF

Frequency	0 Hz – 20 MHz
Level	1 V rms [15 dBm max]
Impedance	50 Ω or 600 Ω
Isolation A to B	>85 dB

- Pulse /DC IRIG Time Code

Frequency	1PPS to 10 MPPS
Level	0-7V p-p
Duty Cycle	0 to 100%
Impedance	50 Ω or 600 Ω

- AM IRIG Time Code

Frequency	1 PPS to 10 MPPS
Level	0-6 V p-p
Modulation Frequency	Up to 1 MHz
Code Format	Any IRIG format, IEEE 1344, NASA 36, 2137, XR3
Impedance	50 Ω or 600 Ω

OUTPUTS - 12

- RF

Frequency	0 Hz – 20 MHz
Level	1 V rms [15 dBm max]
Gain	0 dB to 12 dB trimable
Harmonic	<-40 dBc
Non-harmonic	<-80 dBc
Load Impedance	50 Ω

- Pulse /DC IRIG Time Code

Frequency	1PPS to 10 MPPS
Duty Cycle	0 to 100%
Rise Time	< 20 ns
Fall Time	< 20 ns
Skew	< +2 ns
Load Impedance	50 Ω

- AM IRIG Time Code

Frequency	1 PPS to 10 MPPS
Modulation Frequency	Up to 1 MHz
Code Format	Any IRIG format, IEEE 1344, NASA 36, 2137, XR3
Load Impedance	50 Ω

Standard Rack Mount – 1RU – "Ears" removable

Size:	16.9w x 1.7h x 4.5d	in	**Weight:**	1.0	lb
	43w x 4.31h x 11.5d	cm		0.45	kg

Operating Parameters:
Temperature: 0 to +50°C (0 to +40°C, ±1 min/year for standard TCXO)
Humidity: Up to 90% (non-condensing at +25°C).

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Time Code Interface

Model # TCS 100

The **TCS100** is an automatic time code changeover unit designed to provide automatic or manual switching between two time code sources.

Rack mountable with **RM4**

FEATURES

- Accepts SMPTE / EBU or IRIG-B (modulated and unmodulated TC)
- Automatically determines TC type and switches to the alternate source if TC is lost or if a problem is detected in the primary TC source.
- Decodes both sources of incoming TC, compares availabity and quality of both sources to a third internal standard maintained within the changeover unit and makes logical decisions concerning TC status for the purpose of automatic switchover.
- Front panel switches allow manual selection of source A or B or automatic mode.
- "Good" / "Fail" indication and selection status of each TC source and the changeover unit is shown with front panel LEDs.
- An auxiliary A/B source can be switched along with the TC. This auxiliary switching is a relay contact and can be used to switch any low level control or signal source.
- Internal alarms sound (can be disabled with jumpers) upon loss or failure of a source of TC or switcher unit. A relay contact closure is provided for an external alarm. Alarm can be reset from front panel.
- Status and other system information is provided via a simplex (one way) RS-232, 9600 BAUD

CONNECTORS

- TC inputs: isolated BNC - balanced
- TC output: isolated BNC - balanced
- Balanced input & output connections via DB-9
- Auxilary switching via DB-9
- External alarm via DB-9
- Input power is 12 - 28 VDC

PHYSICAL

- Size: 4.2 x 1.5 x 5.5 inches – (10.6 x 3.8 x 14 cm)
- Weight: 16 oz – (454 g approx. w/o ps)
- Power supply (approximate) 12 oz - 340g
- Cover - eggshell white aluminum
- Front/rear panel - burnished aluminum

POWER

- 12 - 28 VDC external wall mount supplied via 2mm male power connector, UL & CE listed
- 115/230, 50/60 Hz
- Power consumption 6 watts
- Supplied with US, Euro-plug, British or AUS/NZ - Others optionally available

OPERATING PARAMETERS

- Temperature: 0 to +60°C
- Humidity: Up to 90%, non-condensing

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Bell Ringing System

CRL 1000

FEATURES

- Four circuit programmable bell controller synchronized to network time (NTP)
- Industrial or institutional bell ringer system
- Reference external NTP source or use internal clock with accuracy of ±1 minute per year
- Executes up to 256 schedule events per day
- Circuits may be scheduled independently
- Schedule in 12- or 24-hour format
- Front panel displays time or date of internal clock and LED indication of relay activation
- Provides 24VAC, 16 Amps (400VA) with current limited outputs at 4 amps each circuit
- Drives up to 20, 24VAC bells per circuit (80 total bells at 200mA each)
- Master input terminal allows all bells to be rung with external switch closure - usable for master alarms such as fire or general evacuation

Optional Bells

6 in (150mm) 24VAC, .170A, 91 dB @ 10' (*3m*) typical

10 in (250mm) 24VAC, .170A, 94 dB @ 10' (*3m*) typical

SPECIFICATIONS

Configuration and Scheduling Software

- Supports DHCP/BOOTP for automatic acquisition of network address, nameservers, and time server configuration
- NTP synchronization options, and more
- Provides dynamic configuration for networking parameters, time zone/daylight savings time
- Configure clocks through provided Windows network discovery software or TELNET
- Configuration is saved to non-volatile memory and survives power losses
- Encrypted network messages prevent unauthorized tampering of configuration

Physical

Size:	19w x 3.5h x 9.25d in 48.3w x 8.9h x 23.5d cm	**Weight:**	19.5 lbs 8.6 kg

Connectors:

- Ethernet - RJ45
- AC input - IEC connector
- Terminal Block, 24 VAC wiring to bells
- 4 each individual switch circuit breakers - 1 for each bell circuit

Chassis

- Rack mounted welded steel chassis with removable rack ears
- Black or off-white powder coat paint

Power

- Power input 120/240 VAC, 50/60 Hz
- Includes AC input power cord

Operating Temperature

- Temperature: 0 to +70°C

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Bell Ringing System

Bells

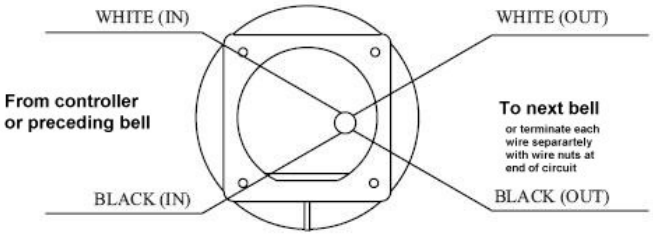
FEATURES

- 6” (150mm) and 10” (250mm) models available
- Vibrating type bell for general purpose signaling
- Low power consumption and high decibel rating
- Use with Masterclock CRL1000 Bell Ringer Controller
- Mounts on standard 4” square (101mm) electrical box
- Indoor or outdoor use, -40° to 150°F (-40° to 66°C)
  (NOTE: outdoor use requires weatherproof mounting electrical box)
- UL Listed
- 4 wire termination – 18 AWG stranded
- Red powdercoat finish

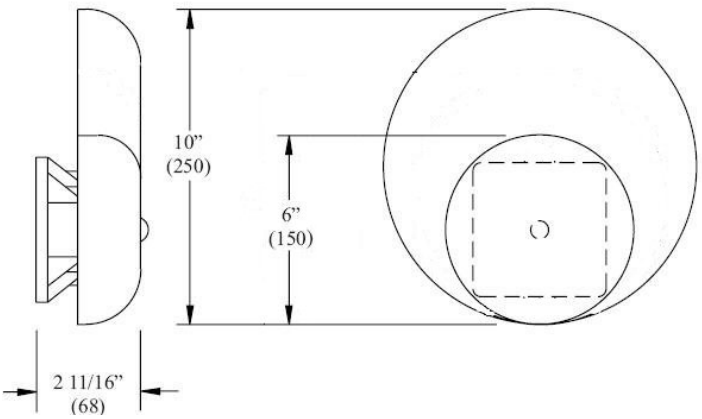
Model	Size Inches (mm)	Input Voltage	Input Current (Amps Max)	Typical dB @ 10' (3m)	Minimum dB @ 10' (3m)
Bl24-6	6 (150)	24 VAC	0.170	91	78
Bl24-10	10 (250)	24 VAC	0.170	94	78

INSTALLATION

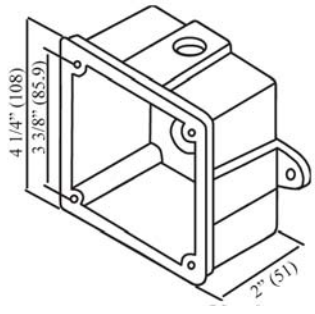
1. Remove the gong
2. Connect wiring (see diagram)
3. Mount bell mechanism to mounting box with striker pointing down.
4. Reinstall the gong, ensuring that the positioning pin is in the hole of the gong.
5. Test for proper operation


WHITE (IN)
WHITE (OUT)
From controller or preceding bell
To next bell
or terminate each wire separartely with wire nuts at end of circuit
BLACK (IN)
BLACK (OUT)

(NOTE: failure to install with striker down will prevent the bell from operating)



Optional Weatherproof Backbox



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Universal Power Supply

PSU 45

Combines power needs for an orderly installation of Masterclock equipment.

Mounts in RM4 rack-mount to supply 28V power for up to nine Masterclock rack-mounted devices.

FEATURES

Universal rack mounted power supply

- Outputs 28 VDC
- Inputs 90-240 VAC/47-63 Hz or 90-240 DC
- 45-watt capacity
- IEC input connector
- Three each DC power plugs (power capacity supports up to nine Masterclock devices)

Rack mountable with an **RM4**

SPECIFICATIONS

Outputs

- Three DC jacks, 28 VDC

Physical

Size:	4.13w x 1.5h x 5.5d inches 10.48w x 3.81h x 14d cm	**Weight:**	16 oz 435 g

Connectors

- IEC power cord
- Power plugs: Three each 2.1mm DC male power jacks, Switchcraft L722A

Case

- Cover: Off-white aluminum
- Front/rear panel: Clear anodized aluminum
- Optional rack mount kit available – RM4

Operating Parameters

- Temperature: 0 to +70°C
- Humidity: Up to 90%, non-condensing

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Power Supplies

PSPOE 15

FEATURES

- Allows power to be transferred over unused pairs of CAT5 Ethernet cable
- Saves on installation cost of wiring power to PoE compliant Ethernet devices
- Compliant with IEEE802.3af PoE standard
- Data and power carried over Ethernet cable
- Works with Masterclock and other PoE compliant clocks and devices
- Non-vented case
- Diagnostic LEDs
- Universal worldwide AC input
- IEC input power connector
- Supplied with choice of US or various international power cords
- Single port

SPECIFICATIONS

Output Voltage	48 V, 0.35 A ±4%
Maximum Output Power	15.4 W
AC Input Voltage	90 to 264 VAC, 47 to 63 Hz
Connectors	IEC power connector
	Ethernet interface: RJ45
Power Cord	IEC power cord available in US, EURO, UK, and AUS/NZ – please specify
Agency Approvals	UL, TUV, CE, FCC

Physical

Size:	2.55w x 1.42h x 5.51d in 6.5w x 3.6h x 14d cm	**Weight:**	0.44 lbs 0.20 kg

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Power Supplies

Cisco 8-, 24- and 48-Port PoE Switches

Cisco SF302-08MP – 8 port PoE switch

- Standards-based IEEE 802.3af Power over Ethernet (PoE) – Up to 8 ports at 15.4W
- Dual gigabit uplinks provide increased bandwidth and redundancy
- 802.1x port authentication and MAC address filtering brings network security down to the switch port level
- Advanced QoS (Quality of Service) enables the network to be optimized for your networked applications, including voice, video and data storage

---

Cisco SF300-24P – 24 port PoE switch

- Standards-based IEEE 802.3af Power over Ethernet (PoE) – Up to 12 ports at 15.4W for 180W of total PoE power
- Secure management via SSL and secure user access via 802.1x port authentication and MAC address filtering
- IGMP snooping, L2/L3 CoS, queuing and scheduling ideal for voice and video
- Intelligent traffic management with rate limiting, policing ACLs, and storm control

---

Cisco SF300-48P – 48 port PoE switch

- Optimized to be your network core with (48) 10/100 Ethernet ports, (2) shared gigabit combo ports and 2 gigabit uplink ports
- Standards-based IEEE 802.3af Power over Ethernet (PoE) - Up to 24 ports at 15.4W for 375W of total PoE power
- Solution ideal for voice and video with IGMP snooping, L2/L3 policy filters
- Secure management via SSH/SSL and secure user access via 802.1x Port Authentication and MAC address filtering

GPS Antennas and Mounts

Standard and Basic

Standard GPS Antenna

The standard antenna, coaxial cable and antenna mounting hardware come standard with GPS-referenced Masterclock equipment packages. The GPS-based product includes the antenna, coaxial cable with connectors, and antenna mounting. This antenna can be mounted either indoor or outdoor so long as it is exposed to the sky. The antenna was initially designed for external mounting in marine environments. It is moisture proof against most normal atmospheric conditions. If indoor it should be mounted in or close to a window.

Optional Cable Packages

PKG1	75' (23m) - ¼" (0.6cm) coax – SMA-M connectors
PKG2	100' (30m) - ½" (1.3cm) coax – SMA-M connectors
PKG3	150' (45m) - ½" (1.3cm) coax – SMA-M connectors
PKG4	200' (61m) - ½" (1.3cm) coax – SMA-M connectors
PKG5	250' (76m) - ½" (1.3cm) coax – SMA-M connectors
PKG6	300' (91m) - ½" (1.3cm) coax – SMA-M connectors
PKG7	350' (106m) - ½" (1.3cm) coax – SMA-M connectors
PKG8	400' (122m) - ½" (1.3cm) coax – SMA-M connectors
PKG9	450' (137m) - ½" (1.3cm) coax – SMA-M connectors
PKG10	500' (152m) - ½" (1.3cm) coax – SMA-M connectors
Per foot	50’ (15m) to 500' (150m), 0.5" (1.3 cm) diameter coaxial cable available on a per foot (per meter) basis. Check with factory for details and pricing.
Antenna Pigtail	18” (46cm) long - 0.25" (1.3 cm) diameter coaxial cable with SMA to SMA installed.

Basic GPS Antenna

Also available is the Basic GPS Antenna. It is a simple, magnet mounting GPS antenna with 16’ (*5m*) of coax cable. This antenna can be mounted either indoor or outdoor so long as it is exposed to the sky.

Standard Antenna

Pre-amplified, gain: 32dB
Voltage: 3.5-5 VDC: 27 mA (max)
Connector: SMA Female
Dimensions: 3.7dia x 5.5h in
9.3dia x 14h cm
Weight: 6.7 oz (190 g)
Environment: -40° to +85°C
with high humidity

50' (15m) coaxial cable

Cable: Belden 8219 or equivalent
Diameter: 0.2” (5mm)
Connectors: SMA - SMA
Length: 50’ (15m)
Weight: 1.25 lbs (0.6kg)
Note that cable is very low loss and that regular RG58 cable will not work.

Antenna Mounting

¾” (1.9cm) PVC threaded pipe
2 each pipe clamps

All Masterclock® GPS receiving devices use either a TNC or SMA connector (jack) for connecting to an external antenna. When 1/2" cable is used and is routed to the receiving device, because of the weight and size of the cable, there could be undesirable mechanical tension or force applied to the receiver connector. This would be particularly true in restricted areas where an adequate bending radius is not possible for the cable. In such cases it is recommended that a "pigtail" section of coaxial cable be used to connect from the larger cable to the receiving connector.

These pigtail sections are fabricated using Beldin 8219 cable and are shipped with appropriate connectors installed.

GPS Antenna Surge Arrestor

Model # SA90-SMA

SA90-SMA Surge Arrestor
(supplied with surge arrestor and SMA female to SMA male cable)

Broadband Surge Arrestor

for DC-3000 MHz applications

Help protect your equipment from the effects of lightning induced surges with the broadband SA90-SMA Surge Arrestor. This DC-passing surge arrestor operates with frequencies up to 3 GHz and helps with protection from lightning strikes. The arrestor is compatible with the IEEE 802.11b standard.

FEATURES

- Easy installation for Masterclock GPS antenna systems- compact design fits in cramped installations
- Weather resistant in mated condition
- Quality protection at a competitive price
- Good return loss characteristics
- Low throughput energy during lightning strikes
- Contains 1 each surge arrestor with SMA female and SMA male connectors and a 18” (45 cm) low loss coaxial pigtail (SMA female to SMA male) everything needed to install the surge arrestor either outside adjacent to the antenna or inside at the receiving hardware.
- For maximum protection 2 units can be installed - see rear of sheet for details.

SPECIFICATIONS

Connectors: SMA Female – SMA Male

Pass Band: DC – 3GHz

Max power handling: 200 W

Impedance: 50Ω

Insertion loss, dB (MHz): Less than 0.2 dB (1000–3000)

VSWR: less than 1.5:1, 2.7 GHz; 1.65:1 3.0 GHz

DC discharge voltage: 90 VDC

Impulse discharge current: 5 KA 8/20 µ max withstanding current

Outer conductor finish: nickel plated

Hardware provided: Grounding screw, washers and terminal lug

Operating temperature: C -40° to +85°

Masterclock, Inc.

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Surge Arrestor Installation

Model # SA90-SMA

WARNING

Ensure that the antenna and coaxial cable that the surge arrestor is protecting is not exposed to direct lightning strikes. This device offers no protection for such strikes and will be destroyed, along with whatever equipment that it is connected to, by a direct strike.

Notice:

The installation, maintenance, or removal of antenna and surge arrestor systems requires qualified, experienced personnel. These installation recommendations are written for such personnel. Installations of this type of energy suppression equipment should be made in accordance with local safety and electrical codes and with regard to good electrical and engineering practices. If you have questions regarding the use of this type of product with respect to your installation, contact a local licensed electrical contractor for the latest electrical codes and guidelines. In no event shall Masterclock, Inc. be liable for any direct, indirect, special, incidental, or consequential damages caused from the installation or use of this product.

Installation:

For maximum protection install two surge arrestors, one outside, either close to the antenna or at the point where the coaxial cable enters the building and a second as close to the receiving equipment. A good rule of thumb to remember is that all lines entering or exiting a building need protection.

The SA90 is a bidirectional RF device. Either RF port may be connected to the equipment side or the antenna side of the transmission line interface to provide protection. Do not leave the RF ports exposed when installed outdoors.

The surge arrestor must be grounded by attaching a ground wire to the grounding lug. This wire must be attached to a master ground bar or the systems earth grounding to ensure a low impedance path to ground. During installation, all grounding contact surfaces must be clean, dry, and free of oxidation.

Grounding Recommendations:

A protection system with a poor ground is the same as having no protection at all.

Recommended grounds are the utility company ground, a ground rod, well casings, and cold water pipes that are of continuous metal. A note of caution, sometimes the metal-cold water pipes are repaired and/or extended PVC piping. The introduction of PVC material renders the cold water pipe ground unacceptable. A thorough investigation of a cold water pipe ground is important since the PVC repairs or extensions may be covered by drywall. Grounds that are unacceptable include sprinkler pipes, PVC pipe, conduit, buried wire and any ground that cannot be verified.

Bonding ensures the most effective ground. Bonding ties all of the grounds in the building together electrically. If there is a rise in ground potential and all of the grounds are bonded, no damage will occur since it is differential voltage that causes problems.

It is absolutely necessary to make sure that the ground used for the AC power is the same as the ground used for the data-line surge protectors. A common ground reference must be achieved for all equipment.

All ground wires must be as short as possible and it is **imperative** that the ground wire not be coiled nor looped – it must be as straight as possible. Regarding the diameter of the ground wire: the **larger the better**.

Finally, the earth ground resistance on which the whole grounding system relies, must be less than 5 ohms between any two points within the ground system.

Rack Mount Bracket

RM4

Anodized Aluminum Rack Mount Kit provides a sleek, compact, rack ready housing for up to four of our devices.

RM4 FEATURES

- Houses up to 4 Masterclock units
- Blank panels are supplied for any unused spaces
- Components can be easily installed or removed in the field

SUPPORTED DEVICES

- GPS200
- MCR1000
- NTP100
- TCA100
- TCC100
- TCC500
- TCD200
- TCI232
- TCI500
- TCINENA
- TCO100
- TCS100

SIZE

- Standard 1RU. 19” x 1 ¾” (*48.25 cm x 4.45 cm*)
- Weight 6oz (*170 g*)

Masterclock, Inc.

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May 2012 Masterclock

Information

Company History

Masterclock staff and assistants
at the recent NAB 2012
convention in Las Vegas.

Masterclock, Inc. engineers and builds synchronized digital and analog clocks used by large corporations, universities, sports teams, broadcasters, law enforcement and the military. These clocks maintain their extraordinary precision by receiving signals from GPS satellites circling the Earth and other sources of accurate time.

Our Founder

William (Bill) Clark (at left in the middle) began building clocks and automation systems for broadcasters in 1986. Starting in a home garage, the operation now enjoys annual revenues in excess of several million dollars per year with customers around the world. Masterclock became incorporated in 1994. The name "Masterclock" is trademarked and registered.

The Impact of Our First Product

The company's first product was the TCR100 Time Code reader card. It was developed to synchronize IBM personal computers in broadcast network automation systems. The success of that initial invention created a demand for more products in which correct and accurate time are critical.

Our Current Catalog

We cater to the needs of the world's most demanding time-sensitive users. Our catalog offers a variety of digital and analog clocks, time and frequency standards, devices to synchronize computers, networks and many other systems where accurate time is required.

Open Standards

We adhere to open worldwide standards for the distribution of time and date information. These include Network Time Protocol (NTP), IRIG, SMPTE and EBU time codes. Many other companies use closed distribution standards that lock the end-user into proprietary hardware and systems. We do not.

Made in USA

In order to maintain and control the quality of every Masterclock device, we engineer, design and build everything we produce in St Charles (a suburb of St Louis), Missouri, USA. Nothing gets shipped overseas until it is ready to be installed at overseas locations for overseas customers.

Information

NTP and Time Code Explained

NTP is an open standard Internet protocol that utilizes standard ethernet wiring to synchronize computers, clocks, networks and other systems to a NTP reference server. The signal can be transmitted over LAN and WAN wired networks and over various wireless systems.

There are numerous public sources of NTP available. Many universities and governmental agencies provide access to NTP servers. Due to the increasing number of requests, some facilities are limiting access, and in some cases charging access fees.

NTP service can be established on your internal network using a stand- alone device such as theNTP100, which and generates NTP from atomic clocks in GPS satellites. GPS receiver cards such as the GPSPCI can also provide a local NTP reference source. In many cases a local NTP server is the recommended approach, due to computer firewalls and other network constraints. In many cases this provides a more accurate and available NTP.

Accuracy of time in a typical NTP installation will depend on many factors, but it is typically better than one half-second after one year without GPS.

Time Code is a low power audio signal similar to the signal of a modem. It contains time and date information. Transmitted over inexpensive coaxial cable and wiring, such as telephone pairs, Time Code wires can be connected in parallel to multiple clocks and computers. With the proper distribution amplifiers (like the TCA100) Time Code can be sent over long distances and connected in parallel to hundreds of clocks and other devices. It is generally an inexpensive, robust and reliable means of distributing time and date around a local plant or operation.

There are many variations of Time Code. Our products generate, amplify, and distribute SMPTE and EBU Time Code for film, video, and audio production and generate, amplify and distrubute IRIG Time Code for government, military, and commercial applications.

With an accurate Time Code source such as the GPS500 and a Time Code reader card such as the TCR500 a local system can be synchronized to within 20 or 30 milliseconds limited only by the software operating system.

Information

Benefits of PoE

Power-over-Ethernet (PoE) extends the versatility for system designers and companies. No longer will one have to locate access points within the typical six foot electrical cord reach of an AC outlet or look for convenient locations to install new outlets at points where its suitable to run conduit and mount outlet boxes.

PoE only requires technicians to run one Ethernet cable – CAT5 or CAT6- to the access point for supplying both power and data. With PoE, Power-sourcing equipment detects the presence of an appropriate "power device" (e.g. PoE hub) and injects applicable current into the data cable. An access point can operate solely from the power it receives through the data cable. The PoE is known by IEEE802.3af international standard.

PoE offers the following benefits:

Cost Savings – It significantly reduces the need for electricians to install conduit, electrical wiring and outlets throughout a facility. Consider an installation of 50 or more access points. This requires lots of conduits, outlet boxes, electrical wiring and the time of qualified electrician(s). The low cost of deploying PoE compared to traditional electrical circuits leads to worthwhile returns on investment.

Flexible Access Point Locations – With PoE a LAN designer has greater freedom to locate access points. You don't need to depend on only locations within short distances from AC outlets. This makes it easy to relocate access points in the future if a need arises.

Higher Reliability – Systems with fewer wires tend to be more reliable. With LANs not using PoE, an electrician may unplug an access point to use its AC outlet to power their equipment. Electricians rewiring electrical circuits could inadvertently cut power to an access point. PoE eliminates the possibility of situations that disrupt the operation of the network.

Enhanced Operational Support – Many PoE devices implement SNMP (simple network management protocol), which enables support staff to remotely manage the electrical power supplied to the access points. Support staffs can disable a PoE-enabled access point by shutting off its access point after detecting a malfunction or tampering. The temporary disabling of the access point can protect against in intruder from continuing unauthorized access to the device(s). Other SNMP-based features enable the monitoring of the condition and consumption of power, which enhance the ability to ensure smooth and efficient network operation.

Easier International Development – For manufacturers, PoE offers the benefit of the vendor not needing to provide different power cords for various countries. This not only helps keep the cost of access points down—it is one less piece of equipment that installer need to worry about.

Power-over-Ethernet (PoE) requires:

(Injector) + (PoE compatible device)

Voltage and Pinout Standards – The IEEE has standardized on the use of 48 VDC as the injected PoE voltage. The use of this higher voltage reduces the current flowing through the CAT5 / CAT6 cable and therefore increases the CAT5 / CAT6 cable length limitations.

All Masterclock, Inc. equipment labeled PoE compatible or compliant will accept and operate from the 48 VDC that is supplied over the CAT5/CAT6 cable.

Information

Domestic Ordering

General

- We accept VISA and MasterCard credit cards.
- We accept purchase orders from firms and institutions with acceptable credit.
- Orders can be shipped COD.
- We offer a 30-day satisfaction guarantee on all of our products. If the product does not meet your requirements, return it within 30 days from the invoice date (undamaged – in the original packing - with all accessories intact and freight prepaid) and cancel the Purchase Order or request a refund if the order has been prepaid. Note that software can not be returned without the associated hardware.

Ordering by Credit Card

Call or fax to place a credit card order. If ordering by fax please include the following information: name on credit card, card number and expiration date and list of items to be purchased.

Acceptance of credit cards is subject to approval by Masterclock, Inc.

Purchase Orders

Mail or fax corporate or institutional purchase order signed by an authorized agent to:

Masterclock, Inc., 2484 W Clay Street, St Charles, MO 63301-2548; 636-724-3776 (Fax)

Acceptance of purchase orders is subject to credit approval by Masterclock, Inc

For information or help with a order contact:

800-940-2248 (US & CAN)

++636-724-3666

sales@masterclock.com

Shipping

Freight charges can be prepaid and invoiced or charged to your freight account. All carriers including the Postal Service are available - unless otherwise specified UPS Ground will be used.

All orders are final after 30 days

Information

International Ordering

TERMS OF SALES

Prices are net US dollars, FOB, our plant. **ALL PURCHASE AND CREDIT CARD ORDERS ARE SUBJECT TO ACCEPTANCE.**

PAYMENTS

Credit cards: We accept VISA and Mastercard

Wire transfer: Please request wire transfer information

Payment in advance by check in US or other equivalent funds: shipment will be delayed until check is cleared

Purchase orders: subject to basic commercial terms and conditions, purchase orders (with net 30 days payment) are accepted from:

- Recognized governments and their agencies
- Recognized international institutions and their agencies
- Other international firms and operations with acceptable credit

SHIPPING

- Freight charges can be prepaid and/or charged to credit cards or to invoice
- Charged to your freight account
- Carriers - DHL, Federal Express, UPS, Airborne, Postal Service or other carrier of your choice
- Orders can be shipped to Customs Brokers or Forwarders
- Go online for shipping sizes and weights: *http://www.masterclock.com/shipping.php*

DUTIES AND TAXES

- Unless credit terms have been established, all duties and taxes must be prepaid prior to shipment or paid upon delivery. If credit terms have been established then duties and taxes can be added to invoice. Duties and taxes can be also be prepaid by wire transfer or billing to credit cards.
- Check with customs, if returning items for repair, to work out shipping issues. Customs may charge duties again unless the proper paperwork is filled out and included when shipping the equipment.
- Go online for harmonizing tariff codes: *http://www.masterclock.com/shipping.php*
- All orders are final after 30 days

Information

International Customers

Airports
Abu Dhabi International Airport
Curaçao International Airport
Leighton Asia-Southern Region Airport
Macau International Airport
Nav Canada
Norman Manley International Airport - Jamaica

Broadcasting and entertainment
Australian Broadcasting
BBC
Canadian Broadcast Corp
Essel Shyam Technologies Ltd
EUROCOM Broadcast
Gencom Australia
Gencom New Zealand
Hong Kong Cable TV Ltd.
Icelandic National Broadcasting Service
Kondo Broadcast Systems
Latvia State Radio and Television Centre
Leitch Video
Maestrovision
Norwegian Broadcasting Corp., Ltd
Pixcom International, Inc.
PT GALVA Technovision
Rogers Cable TV
Romanian Radio Broadcasting
Santec-Media GmbH
SBS - Australia
Sistemas Digitales en Audio y Video
Sky Channel
Societe Radio-Canada
Sonotechnique
Sony Systems
Sydney Broadcasting Company
Tel-Ad Jerusalem Studios
Tele-Metropole
Telemundo of Puerto Rico, Inc
Teletec De Mexico S.A. de C.V.
Televizijos ir rysio sistemos
TV JAPAN
TV2/Nord
Videocraft Australia Pty Ltd

Churches
Soeurs de Sainte-Anne

Computers and hi-tech
Havelsan Inc
Ingenieria Digital Aplicada S.A.
Instronic Instrumentos de Testes
Instrumentos Industriales del Pacifico
IntegraKom S.A.
Invensys Systems
Masaland Informatique
Maxine Co. Ltd.
Network Electronics srl
Omega Integration Pte Ltd.
Optilan UK Limited
Oxygen DCT Ltd
Samsung Semiconductor
Saudi Media Systems
Schneider Electric Peru S.A.
Sematron U.K. Ltd
Shanghai Astronomical Observatory
Siemens - South Africa
SINYAL Elektronik San. ve Tic.A.S.
Sistemas Electronicos
Suministros Electromecanicos
SYSCOM - Dubai
Tamuz-Dongseo Electronics Co., Ltd.
Telecom Engineering Workshop-Dartmouth
VCS Aktiengesellschaft
Vibro Korea Co. Ltd.

Hospitals and healthcare
Zortek Systems

Industries
Abu Hijleh Electrical Contracting Co.
Ademco Security (Far East) Pte Ltd
Advanced Electronics Co. Ltd-Saudi Arabia
Allied Signal
APM Technologies
APPRO International
Dagang Teknik Sdn. Bhd.
Dong HWA A.V Co., Ltd.
Dongjin Comm System Inc.
EMC Corp
Ericsson
EUROCONTROL Experimental Centre
Excalibur Systems UK Ltd.
Inteligo Financial Services.S.A.
Mechasolusindo International
Moore Products
Oger Systems
Positron Oy
Radikal Muzik Ltd.
Sea Change
S&C Electric do Brasil
Sinuantunas Mandiri PT
Terra Vermessungen
Transas Scandinavia AB
TRW
VeriFone
Yamaha Motors
Yokogawa

International Governments
Australian Government
Defense R&D Canada
Federal Republic of Germany, Liason Office
Royal Canadian Mint

Law enforcement
Abbotsford (Canada) Police Department
Reykjavík, Iceland
Royal Canadian Mounted Police
QinetiQ Ltd.

Military and aerospace
Manitoulin Transport - M.E.T.
Meterological Service of Canada
NATO HQ OTAN Autoroute Bruxelles-Zaventern
Naval Air Facility Atsugi Japan
NavCanada
Oerlikon Aerospace, Inc.
Swedish Space Corporation
Strategic Test Scandinavia AB

Sports
Formula One Management Ltd
Manchester City Football Club

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Memorial University of Newfoundland
Queens University
Ryerson University

Utilities
BC Hydro & Power
Cutler-Hammer
Hydro Quebec
Manitoba Hydro
Ontario Hydro
Newfoundland & Labrador Hydro
Soluziona (Norcontrol Soluziona)

Information

Domestic Customers

Airports
General Mitchell Intl Airport
Indianapolis Airport
Kahului Intl Airport
Lambert St. Louis Intl Airport
Los Angeles World Airports
Raleigh Durham Airport
Spirit of St. Louis
Ted Stevens Anchorage Intl Airport

Broadcasting and Entertainment
ABC-Radio and TV
Adventist World Radio
Associated Press
CBN-Center
CBS Radio and TV
Clear Channel
Court TV
Direct TV
Fox Group
Freedom Communications
Heartland Video Systems
Hughes Direct TV
IMAX
Kencom
King Television
Koahnic Broadcast Corp
Kontron America
Learfield Com.
NBA Entertainment
NBC-TV
NPR
Odetics Broadcast
Panavision Intl L.P.
Paramount Pictures
PBS-All Stations
PBS-Network
QVC-Network
Reuters
Scientific Atlanta
Sony Systems
TCI-Encore Media
Time Warner Cable
Turner Broadcasting
TVN Entertainment
USA-Networks
Video Broadcast
Video Communications, Inc
Video Copy Serivce
Video Digital
Video Systems of the Carolinas
Voice of America
Warner Brothers
Weather Channel
Westinghouse
World Wrestling Entertainment
Worldwide TV Sales
and 188 Radio and Television
Stations in the USA

Churches
Agape Christian Ministries Church
Bible Explorations
Blawkhawk Ministries
Calvary Church
Church of Latter-Day Saints
Church at Pinnacle Hills
Faith Miracle Temple
First Baptist of Jacksonville
Holy Land Experience Ministries
Hour of Harvest
Inspirations
Menlo Park Presbyterian Church
NorthRidge Church
Providence Baptist Church
Victory Life Family Worship Center

Computer and Hi-Tech
Kontron America
Honeywell
IBM
Intel
Los Alamos National Lab
Metrum
Microsoft
Wavetronix

Industries
Adobe
Amazon
ASC
AstreZeneca Pharmaceuticals
Bed Bath & Beyond
Borg Warner
Commerce Bank
Dictaphone
Energizer
Exxon Mobil Chemical Co
Frito-Lay
GAF
General Electric
General Instruments
General Motors
Graybar Electric Co Inc
GTE Government Sys.
Honeywell
ITT
Jelly Belly Candy Company
Kroger-Swan Island Dairy
L'Oreal USA
Lorillard Tobacco Company
Maryland Adv. Lab
Phillip Morris USA
Rock-Tenn Company
Rockwell Automation
SAIC - Science Applications Intl Corp
Siemens
Sperry-Sun
Symmetricom Inc
Teknon Corp
VISA
Walmart
Walt Disney
WPCS International Inc
Wunderlich-Malec Engineering
WW Wood Products
Xerox

Hospitals and Healthcare
Abbott Laboratories
Angel Medical Systems Inc.
Arkansas Children's Hospital
AstreZeneca Pharmaceuticals PL
Avera St. Anthony's Hospital
Bausch & Lomb, Inc.
Baxter Healthcare
Boston Childrens Hospital
Clark County 911
Denver Health Medical Center
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Exceptional Medical Transportation
Green Medical Supply
Kettering Medical Center
Lee Memorial Health System
Mayo Clinic
Monroe County Medical Center
Schoolcraft Memorial Hospital\
St. Joseph Hospital
State of Delaware-Emerg Health
UAB Health System
University of Michigan Med School
University of Illinois/College of Med
University of Texas-SW Med Center
Zortek Systems

Law Enforcement
Beltrami County, MN
Bexar Metro, TX
Bibb County, AL
Blue Earth County, MN
Boone County, IA
Bowling Green, KY
Brownwood, TX
Burbank, CA
Calloway County , GA
Campbell County, KY
Cape Girardeau, MO
Carlyle, IL
Carroll County, IA
Cass County, GA
Catawba County, NC
Chicago, IL
Clark County, IN
Collinsville EMA, IL
Columbia, MO
Cooper County, MO
Coral Springs, FL
Dallas County, TX
Douglas County, MN a nd WI
Dover, DE
Durham, NC
Eau Claire, WI
Escambia County, FL
Fairbanks Police, AK
Fulton County, GA
Gilchrist County, FL
Glendale, AZ
Grand Island, NE
Greenbriar County, WV
Irving, TX
Lakeland, FL
Lakeland, MN
Los Angeles Police Department
Markham, IL
Milwaukee Police Department
Naperville, IL
Norfolk, VA
Orlando, FL
Phoenix, AZ
Redding, CA
Riverside, CA
Saint Charles, MO
Saint Louis, MO
San Luis Obispo, CA
Tacoma, WA
Tampa, FL

Military and Aerospace
Aerospace Corp
Ball Aerospace
Boeing
General Atomics Aeronautical
Systems
General Dynamics
Jet Propulsion Laboratory
Lockheed Martin
NASA
Naval Research Lab
Naval Space Technology Labs
Northrup Grumman
Phillips Aerospace
Raytheon
SpaceX
SPAWAR - Space and Naval Warfare
Systems Command
US Air Force
US Army
US Army Corp of Engineers
US Coast Guard
US Navy
USS Oklahoma City
USS Providence
White House Comm Agency

Sports
Chicago Cubs
Dolphin Stadium
Comcast Sports
Empire Sports Network
NBA Entertainment

Universities and schools
Bob Jones University
Brigham Young University
Drake University
Drexel University
Duke University
Florida Space Institute
Howard University
Johns Hopkins University
Kansas City, Missouri, School District
Los Angeles County Office Of Edu
Michigan State University
Penn State University
Purdue University
Saratoga High School
Student Loan Mktg Assoc.
UCLA
US Merchant Marine Academy
University of Akron
University of Alberta
University of Arizona
University of Massachusetts
University of Michigan Med School
University of Missouri
University of Nebraska
University of New Hampshire
University of North Carolina
University of Pittsburgh
University of Texas-Dallas
University of Toronto
University of Washington
Virginia Tech
Volunteer State Community College
Washington University - St. Louis
Woods Hole Oceanographic Institute

US Government
Department of Defense
Department of the Air Force
Departmenf of the Army
Department of the Navy
Department of Veterans Affairs
FAA - Federal Aviation
Administration
FBI
Federal Bureau of Prisons
NOAA - National Oceanic and
Atmospheric Admin.
Social Security Administration
US Bureau of Reclamation
US Department of Agriculture
Veterans Administration

Utilities
Garland Power and Light
Georgia Power Co
Greenville Utlities
Illinois Power
Kansas City Power & Light Co
Koeberg Nuclear Power Station
Mississippi Power
New York Power Authority
Nuclear Management Company
Omnipower Electric
Puget Sound Energy
Springfield City Utilities
TECO (Tampa Electric Co)
Tennessee Valley Authority
Wolf Creek Nuclear Operation Corp

1.1 SCOPE
This document specifies a wired clock system that relies on the accuracy of the **Global Positioning Satellite (GPS)** system forsynchronizing the time provided to clocks and network devices using the **Network Time Protocol (NTP)**. Such a clock system relies on one or more NTP time servers with an integrated GPS receiver, to act as **master clocks** and virtually an unlimited number of network clock displays acting as **client devices.** In addition, other network client devices can benefit from the availability of the NTP timeservers. Data and low voltage DC power can be distributed over the same network cable using **Power over Ethernet** technology, resulting in significant cost savings. The limitations are primarily network configuration and implementation based, as the system can be added to an existing network or configured as an independent network to simply provide asynchronized clock display system.

1.2 GENERAL
NTP (Network Time Protocol) servers allow clients to synchronize clocks, bells, computer clocks, other computer timing devices and other kinds of network equipment using a standard reference of time accepted worldwide, known as **UTC (Universal Time Coordinated)**. NTP servers with an integrated GPS receiver located on a **LAN (Local Area Network)** can provide the high accuracy of the GPS satellite system to provide the UTC reference time, eliminating the need to receive time from a NTP server located on the Internet. Placing one or more NTP on your local network behind a facility firewall enhances reliability, redundancy, accuracy, and security.

Using NTP is clearly an advantage since itpermits automatic synchronization of all the equipment hooked up to the network, thus reducing the need and associated cost for personnel to travel to remote clock locations to set the time manually. In general, it has been observed that since the recent introduction of NTP as a standard for network synchronization, clock installations have become easier, better synchronized, more reliable, and provide a traceable source of time for critical network functions, resulting in lower overall cost.

NTP provides a simplified protocol called **SNTP (Simplified Network Time Protocol)**, which clients can utilize to set the time to trusted NTP timeservers. SNTP V4 is a subset of the full NTP V3 version and is widely accepted for client devices.

Information For a GPS Synchronized Clock System using Network Time Protocol and Power over Ethernet

POE (Power over Ethernet) is a recognized and a growing method of significantly reducing installation costs and providing low voltage DC power to network devices by distributing power over the unused pair of standard network cables. The modest incremental cost of purchasing POE equipment that is compliant to the IEEE 802.3af standard, **dramatically offsets the installation costs and safety issues** associated with utilizing and distributing AC power. A GPS Synchronized clock system using NTP and POE offer significant installation and maintenance cost benefits over traditional clock systems.

2.1 GENERAL SYSTEM REQUIRMENTS
The synchronized clock system shall meet or exceed the requirements of this specification in all aspects.

2.2 OPERATIONAL REQUIREMENTS AND ENVIRONMENTAL SPECIFICATIONS
The clock system shall be located and operated in an indoor environment, within the parameters of a standard network configuration, and utilizing standard industry provided network equipment and distribution methods, including standardized POE distribution technology. The clock system shall operate autonomously and provide software configuration options for time zone offsets, automatic daylight saving time corrections without scheduled operator intervention or maintenance. The clock system shall be configured via software control and shall allow for remote monitoring and configuration changes while providing password protection.

Environmental specifications
The system shall operate under the following environmental conditions:
- Operating Range: 32° F to 122° F (0° C to 50° C)
- Storage Range: -40° F to 70° F (-40° C to 70° C)
- Relative Humidity: 0-90%, non-condensing

Compliance specifications
All equipment shall be tested, labeled and certified by a nationallyrecognized and approved testing laboratory to meet the following low voltage safety and electromagnetic compliance requirements of the United States and European Union.
- FCC, part 15, Class B limits for radiated and line conducted emissions
- Electromagnetic Compatibility 89/336/EEC; 92/31/EC; 93/68/EEC;2004/108/EC
- Low voltage directive 2006/95/EC

2.3 CLOCK ENGINEERING REQUIRMENTS AND PERFORMANCE
The network clocks shall meet the following engineering and performance requirements.

2.3.1 NETWORK CLOCK ENGINEERING GENERAL SPECIFICATION
The network clocks shall be designed to provide years of reliable and maintenance free service and shall be constructed of all metal enclosures with high impact, UV stable lenses to ensure structural integrity and maximum durability. A wall mounting bracket, or other means, shall be provided for mounting to the surface of a wall. The finish of the network clocks shall be of a high quality, durable, painted textured powder coat finish and available in a choice of colors. The network clocks enclosure shall be available in optional unpainted stainless steel material and finish for special applications.
The network clocks shall be available in double faced or dual mount options for applications in hallways or corridors.
The network clocks shall be designed for easy, cost effective, and reliable installation and use standard RJ45, 10MB Ethernet style connectors.

Accuracy:
The networks clock displays shall be accurate to within 50 milliseconds of the UTC time reference provided by the NTP server(s), when synchronized.

Protocol:
The Ethernet wired clocks shall support the following protocols:

SNTP, Simple Network Time Protocol
The network clocks shall operate with an internal reference time that is set to UTC (Universal Coordinated Time) via a built-in the SNTP client, from up to two NTP timeservers. Selection of the primary and secondary servers shall be automatic, but configurable by either static IP address or DHCP provided IP address configuration methods. The network clocks shall be configurable to operate as an SNTP client in the following operational modes: unicast (or query), broadcast, or multicast.

DHCP, Dynamic Host Configuration Protocol
The network clocks shall utilize **DHCP (Dynamic Host Configuration Protocol)**, by default, as a means of automating the configuration of all required network settings utilizing the optional settings area of a DHCP server. All DHCP network and optional NTP settings shall allow for enabling or disabling at each clock, in order to use static IP address mode network and NTP settings.

Power:
The network clocks shall utilize a standardized Power over Ethernet (POE) technology to power the clock in compliance with the IEEE 802.3af Power over Ethernet specification. The network clocks shall be considered to be and to operate as Powered Devices (PD); and shall utilize a 48V DC nominal voltage supplied over the spare Ethernet network cable pairs, and/or the shared data/pairs, from an IEEE 802.3af compliant Power Sourcing Equipment (PSE) device, with a 10/100 MB rating, for a distance of up to 100m (328 ft). Power consumption shall be less than 12.95 Watts maximum for all PD equipment. Each network clock PD shall have a typical power rating of less than 7.5 W.

The network clocks shall be made available with an optional AC power. The power input shall be made as a universal type with an input power range of 90-264 VAC, 47-63 Hz and utilizing a standard IEC power jack.

Connectors:
Ethernet 10/100 Base-T: RJ45
The network clock system shall utilize standard Cat 5 or Cat 6 cabling for the distribution of either data, or data and power using the same standard cable, and eliminating the need for an AC power source at the clock location.

Configuration settings:
The time displayed on the face of the network clocks may either be UTC time or local time and shall be configurable via software. Clock displays shall offer flexibility to allow for any international time zone offset and automatic Daylight Saving Time (DST) adjustment and shall provide maintenance free reliable operation. Configuration changes shall be retained in non-volatile flash. The network clocks shall utilize an internal maintenance free rechargeable battery backed real-time clock (RTC) to retain the internal time in the event of a power outage or for conditions when the NTP server(s) is not available. The network clocks shall not display the time during a power outage, but shall recover from such power outage as a system without intervention. During such “free-wheeling” periods and while in operation, the network clocks shall provide a visual indication that the device is relying on the internal oscillator and is not currently synchronized to the network timeserver.

2.3.2 ANALOG CLOCK ENGINEERING SPECIFICATION
The shape of the analog clock shall be round 12” [30 cm] or 18” [46 cm]. The face of the clock shall be off-white, the time indication marks on face shall be black. The hour markings shall be in an Arabic numeral format and in an easily read font. Minute /second marking shall be provided. The analog clock shall have black hour and minute hands and a red second hand indicator.

The analog clock shall contain a stepper motor drive and state of the art microprocessor and electronics control to rapidly synchronize the hands on the face of the clock to an accurate NTP (Network Time Protocol) reference. The stepper motor drive and gear system shall be of all metal construction for long maintenance free life and high product reliability.

The gear and drive train system shall be smooth and quiet in operation to minimize motor noise. An LED status indicator on the face of the clock shall illuminate when the clock is not synchronized. The analog clock shall be available with the following options: LED illumination, double face ceiling or wall mount, stainless steel enclosure.

2.3.3 DIGITAL CLOCK ENGINEERING SPECIFICATION
The displays shall utilize LED's (Light Emitting Diodes) such that they are easy to read in various lighting conditions, allow for large viewing angles, maximum-viewing distances, long life expectance, and do not require back lighting. The LED's shall be available in various colors including red, amber, green, and blue displays for various visibility requirements and in various sizes including 2.3" [5.8cm], 4" [10cm], and 7" [18cm] character heights. In addition, the brightness of the LED display shall be fully adjustable via software to allow for the display to be dimmed or brightened remotely, in order to accommodate various lighting conditions and requirements.

3.0 CONFIGURATION SOFTWARE
The network clock system shall be fully configurable and managed remotely through IP via software to simplify the costs associated with administration.

GUI Interface – Windows configuration
The network clock system shall include a **GUI (Graphical User Interface)** based network software application, operating under the Windows OS, for configuration and maintenance of [the network time server and] all network clocks. The GUI application shall include password protection of the clock configuration, encrypted communication, and the ability to enable or disable options that might reduce security. A status display to remotely monitor the time displayed on the clock, the internal UTC time, synchronization status, and any error condition regarding the clocks network status shall be provided. An optional advanced Windows based GUI configuration software package shall be available for separate purchase, for quickly configuring groups of clocks with the ability to save and load configurations.

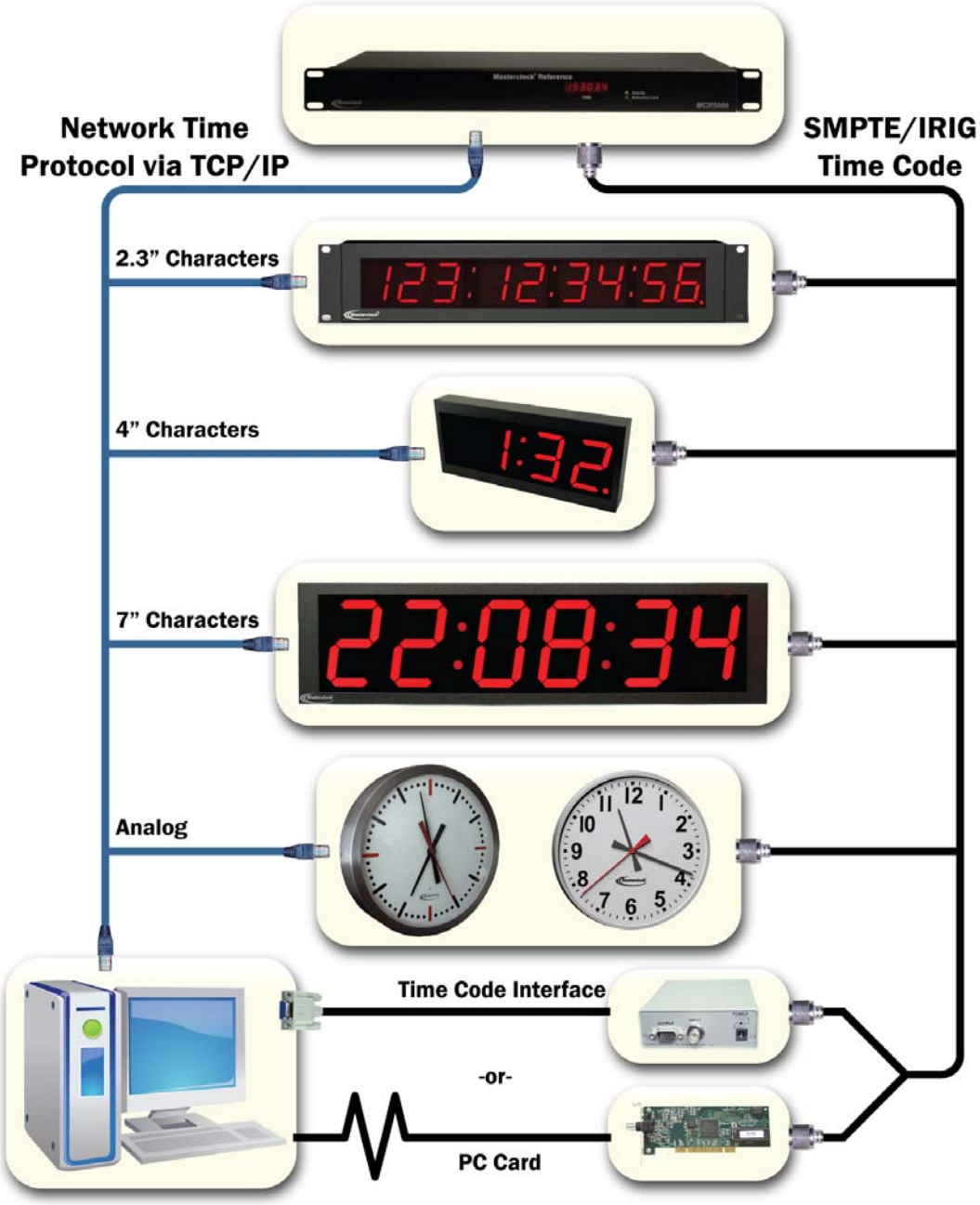
Console interface –
Unix/Linux, non-Windows platform configuration
A separate menu driven telnet console interface shall be provided for configuration, of the network time server and network clocks on a non-Windows OS such as UNIX, Linux.

4.0 REPAIR AND MAINTENANCE
Designed as solid-state devices, the clocks shall require no standard maintenance and shall have no user serviceable or replaceable parts inside in order to reduce the requirement for on-site maintenance and repair personnel. Any necessary firmware updates shall be made available and able to be applied on location. Instructions and required update files shall be made available for download from the manufacturer's website. A procedure for trouble-shooting typical installation, configuration, and operational issues shall be supplied as part of the documentation, as part of the user manual.
The manufacturer shall make warranty repair and service, as well as non-warranty repair service, available.

Information

System Operations

Time synchronization is more crucial than ever before. It has also never been easier to accomplish. Masterclock provides complete solutions using open standards like NTP (Network Time Protocol) and SMPTE/IRIG Time Code. Just one device can receive atomic clock time and output it to both NTP and Time Code. The timing signal from there can be sent out to your network over standard cat5 or cat6 cable to sync clocks, computer and other equipment or down daisy-chained coaxial cable to sync clocks computers and other equipment that use Time Code.



Information

Product Warranty

LIMITED HARDWARE WARRANTY

This Masterclock, Inc. (hereinafter Masterclock) product warranty extends to the original purchaser.

Masterclock warrants all electronic hardware products against defects in materials and workmanship for a period of **one year** from date of sale. If Masterclock receives notice of such defects during the warranty period, Masterclock will, at its option, either repair or replace products, which prove to be defective.

Should Masterclock be unable to repair or replace the product within a reasonable amount of time, the customer's alternate remedy shall be a refund of the purchase price upon return of the product to Masterclock. This warranty gives the customer specific legal rights. Other rights, which vary from state to state or province to province, may be available.

EXCLUSIONS

The above warranty shall not apply to defects resulting from improper or inadequate maintenance by the customer, customer-supplied software or interfacing, unauthorized modification or misuse, operation outside of the environmental specifications for the product or improper site preparation and maintenance (if applicable).

WARRANTY LIMITATIONS

MASTERCLOCK MAKES NO OTHER WARRANTY, EITHER EXPRESSED OR IMPLIED, WITH RESPECT TO THIS PRODUCT. MASTERCLOCK SPECIFICALLY DISCLAIMS THE IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. In any state or province which does not allow the foregoing disclaimer, any implied warranty of merchantability or fitness for a particular purpose imposed by law in those states or provinces is limited to the one-year duration of the written warranty.

EXCLUSIVE REMEDIES

THE REMEDIES PROVIDED HEREIN ARE THE CUSTOMER'S SOLE AND EXCLUSIVE REMEDIES. IN NO EVENT SHALL MASTERCLOCK BE LIABLE FOR ANY DIRECT, INDIRECT, SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES, WHETHER BASED ON CONTRACT, TORT, OR ANY OTHER LEGAL THEORY.

In any state or province, which does not allow the foregoing exclusion or limitation of incidental or consequential damages, the customer may have other remedies.

LIMITED SOFTWARE WARRANTY

This Masterclock, Inc. (hereinafter Masterclock) product warranty extends to the original purchaser.

30 Day Satisfaction Guarantee

For thirty (30) days after date of delivery of the SOFTWARE to you, if you are dissatisfied with the SOFTWARE for any reason you may return the complete product, with your receipt, to Masterclock, postage prepaid, during the thirty (30) day period for a full refund.

Limited Warranty for Next 60 Days

Masterclock warrants that for the sixty (60) days following the initial thirty day period, as evidenced by a copy of your receipt, that:
(1) The SOFTWARE will perform substantially the functions described in the documentation provided by Masterclock.
(2) The media on which the SOFTWARE is furnished will be free from defects in materials and workmanship under normal use. Your sole remedy under the warranty during this sixty (60) day period is that Masterclock will undertake to correct within a reasonable period of time any reported "SOFTWARE Error" (failure of the SOFTWARE to perform substantially the functions described in the documentation), correct errors in the documentation, and *replace any magnetic media which proves defective in materials or workmanship on an exchange basis without charge. In order to make a claim under this warranty you must return the defective item with your receipt to Masterclock, postage prepaid, within ten (10) days after the warranty period. If Masterclock is unable to replace defective media or if Masterclock is unable to provide corrected SOFTWARE or corrected documentation within a reasonable time, Masterclock will, at its sole and exclusive option, either replace the SOFTWARE with a functionally equivalent program at no charge to you or refund the license fee of the SOFTWARE. These are your sole and exclusive remedies for any breach of warranty during this sixty (60) day period.

Masterclock does not warrant that the SOFTWARE will meet your requirements, that operation of the SOFTWARE will be uninterrupted or error-free, or that all SOFTWARE errors will be corrected. Masterclock is not responsible for problems caused by changes in the operating characteristics of computer hardware or computer operating systems which are made after the release of the SOFTWARE, nor for problems in the interaction of the SOFTWARE with non-Masterclock software. Masterclock will have no responsibility to replace or refund the license fee of media damaged by accident, abuse or misapplication. THE ABOVE WARRANTIES ARE EXCLUSIVE AND IN LIEU OF ALL OTHER WARRANTIES, WHETHER EXPRESSED OR IMPLIED, INCLUDING THE IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND NON INFRINGEMENT. NO ORAL OR WRITTEN INFORMATION OR ADVICE GIVEN BY MASTERCLOCK, ITS EMPLOYEES, DISTRIBUTORS, DEALERS OR AGENTS SHALL INCREASE THE SCOPE OF THE ABOVE WARRANTIES OR CREATE ANY NEW WARRANTIES.

SOME STATES DO NOT ALLOW THE EXCLUSION OF IMPLIED WARRANTIES, SO THE ABOVE EXCLUSION MAY NOT APPLY TO YOU. IN THAT EVENT, ANY IMPLIED WARRANTIES ARE LIMITED IN DURATION TO NINETY (90) DAYS FROM THE DATE OF DELIVERY OF THE SOFTWARE. THIS WARRANTY GIVES YOU SPECIFIC LEGAL RIGHTS. YOU MAY HAVE OTHER RIGHTS, WHICH VARY FROM STATE TO STATE.

LIMITATION OF REMEDIES

REGARDLESS OF WHETHER ANY REMEDY SET FORTH HEREIN FAILS OF ITS ESSENTIAL PURPOSE, IN NO EVENT WILL MASTERCLOCK BE LIABLE TO YOU FOR ANY SPECIAL, CONSEQUENTIAL, INDIRECT OR SIMILAR DAMAGES, INCLUDING, WITHOUT LIMITATION, DAMAGES FOR LOSS OF BUSINESS PROFITS, BUSINESS INTERRUPTION, LOSS OF DATA OR BUSINESS INFORMATION (OR OTHER PECUNIARY LOSS) ARISING OUT OF THE USE OF OR INABILITY TO USE THE SOFTWARE OR ANY DATA SUPPLIED THEREWITH EVEN IF MASTERCLOCK OR ANYONE ELSE HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES, OR FOR ANY CLAIM BY ANY OTHER PARTY. SOME STATES DO NOT ALLOW THE LIMITATION OR EXCLUSION OF LIABILITY FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES SO THE ABOVE LIMITATION OR EXCLUSION MAY NOT APPLY TO YOU. IN NO CASE SHALL MASTERCLOCK'S LIABILITY EXCEED THE PURCHASE PRICE FOR THE SOFTWARE.

Information

Return Merchandise Policy

If you are having a problem with any of our merchandise, a quick call to our service department will typically solve it.

Domestic RMA Policy & Form
International RMA Policy & Form

If you wish to return merchandise, please download and fill out the appropriate RMA (Return Merchandise Authorization) PDF form at left. A Masterclock RMA number is required. AFTER 30 DAYS ALL SALES ARE FINAL

Please call ahead to make arrangements:

RMA Phone (636) 724-3666; RMA Fax (636) 724-3776

Our RMA policy is straight forward and is based on several basic premises:

An item can be returned, subject to several basic requirements under our 30-day Satisfaction Guarantee.

1. If an item fails within the warranty period we will repair and return it freight prepaid.
2. If an item is outside the warranty period and requires repair we will inspect, repair and return the item to you for a reasonable charge for the work and the cost for freight.
3. If you think an item or system is not working properly we expect you to read the instruction manual, talk to our customer service department and make a reasonable effort to resolve the problem
4. If you return an item to us for repair or "because it doesn't work" and the item is found to work properly then we will charge you an "Analysis / Inspection" charge plus the return freight.
5. The above RMA request forms and the RMA polices and procedures (at right) are intended to clarify rules, prevent misunderstanding and to expedite the resolution of problems.

Any returned merchandise must be packed in the original shipping container and packing material complete with all instruction booklets and accessories, be free of any blemishes and show no signs of damage.

Please do not ship items back for repair with accessories, unless accessories are suspected to be the cause of the problem or unless instructed to do so by customer service. If customer returns such or other extra items not specified when requesting RMA number on RMA Request Form customer hereby releases Masterclock from any responsibility regarding loss or damage of those items.

Warranty –

See our complete warranty statement in your product manual, or on the web here, or request a copy by mail or fax.

RETURN MERCHANDISE AUTHORIZATION POLICIES AND PROCEDURES

Terms – Evaluation/Satisfaction Guarantee Return

Masterclock, Inc. offers a 30-day Satisfaction Guarantee on all of our products. If the product does not meet your requirements, return it within 30 days from the invoice date and cancel the Purchase Order or request a refund if the order has been prepaid. This return privilege is subject to the following conditions: **Any returned merchandise must be packed in the original shipping container and packing material complete with all instruction booklets and accessories, be free of any blemishes and show no signs of damage**. Please note that software cannot be returned without the associated hardware. **A RMA is required**, which must be obtained within 30 days of the date of the original Masterclock invoice, before any item can be returned.

You, the purchaser, are responsible for ALL freight, insurance and taxes (if any) for both shipping and returning any product and agree to pay any such charges that may have been included on the original Masterclock invoice. Because the cost associated with evaluation processing and returns can be substantial (for both parties) we ask that you limit items ordered for evaluation to the minimum quantity/units needed

Warranty Return – Items returned for repair or replacement within applicable warranty period:

1. If an in-warranty item is found to be defective it will be repaired or replaced by Masterclock in accord with our warranty policy and returned via prepaid ground freight.
2. If a returned item is found not to be defective then return freight and insurance will be charged to the customer in addition to fees described below.
3. Incoming freight (and insurance) for all returned items must be prepaid by customer.
4. A $100 analysis fee will be charged for items that are returned as defective but test functionally good and for items that have been modified or damaged by customer - such items will be returned unprocessed to the customer. Repair Return - Items returned for repair after expiration of warranty period:
5. You will be advised of the cost of any repairs and we will require a credit card number or purchase order prior to any work being started. A $100 analysis fee will be charged for any un-repaird item returned at the customer's request.
6. A $100 analysis fee will be charged for any item that is returned for post warranty repair as defective but test functionally good.
7. Merchandise received, which has been modified by customers will be returned unprocessed to the customer and a $100 analysis fee will be charged for items so returned.
8. Incoming and return freight (and insurance) for all returned items will be charged to customer.

Exchange –
Refers to returning items to receive different part number:

9. Items that are returned for credit or "change" due to a mistake on customer's part (ordered wrong, end user changed their mind, improper installation, etc.) will be exchanged only after receipt of authorization for payment for 15% of item value with a minimum charge of $50.

10. After 30 days - all sales are final.

Filling out RMA Request Form --

11. RMA numbers will be issued only with the proper INVOICE NUMBERS.

12. You must provide an explanation for your return. If the item is defective, please provide a detailed description of the problem.

13. Mark the action you desire to be taken in regards to your RMA - Evaluation Return, Warranty Return, Repair Return or Exchange. If you are requesting an exchange, please indicate which items/quantity you wish to exchange for. Shipping Items - RMA Number:

14. RMA numbers are good for 30 calender days only - no exceptions. RMA's returned after this time will be automatically refused.

15. Merchandise returned without an RMA number clearly marked on top of the box, or returned without prior authorization, will be automacially refused.

16. Merchandise returned COD will be automatically refused.

17. Masterclock has a **Ship after Receive** policy. We must receive the products before we can ship your replacements. If any item is critical to your operation we suggest that a backup item/system be purchased - talk to our sales department.

Other Suggestions --

18. Please have RMA number and RMA Request Form available when calling Masterclock regarding an RMA.

If the RMA department is not available, and you are transferred to voice mail, please leave your name, company name, RMA number and reason why you are calling on your recorded message.

RMA#

Masterclock's RMA Request Form

PLEASE SEE ATTACHED RMA TERMS & CONDITIONS FOR ADDITIONAL DETAILS

Date: _____ Company Name: _____

Address 1: _____ Address 2: _____

City: _____ State/Country: _____ Zip/Code: _____

Contact Person: _____ Phone: _____ Fax: _____

Quantity	Model #	Serial #	Invoice Date	Invoice #

Type of return:

Credit Exchange Upgrade Warranty Repair Non-warranty Repair

Detailed reason for this return:

_____

_____

_____

We will make every reasonable attempt to resolve the problem to your satisfaction and, if necessary, will contact you after you submit this request by email or fax. If we do issue an RMA, please do not delay in returning the item, as this RMA will expire in 30 days. **All sales are final after 30 days.**

Each unit returned and found to meet all functional requirements, you agree to pay the $100 evaluation fee and the return shipping charges as outlined in the terms and conditions.

By typing your name below you agree to Masterclock's RMA terms and conditions.

I have received, read, understand and agree to the Masterclock RMA terms & conditions.

_____ _____

Signature for authorizing repair Date

For Internal Use Only				
Return Received By:	_____	Received On:	_____	Note: _____
Replacement Sent:	Y / N	Sent On:	_____	_____
Restocking Fee:	_____	Credit Amount:	_____	_____

CUSTOMER REQUEST FOR CREDIT

This is a request for net 30 days credit from date of shipment. We understand and agree that if payment is not received by Masterclock within 30 days of shipment date then a 1.5% charge will be added for each month or part thereof that the payment is late.

Please print or type and complete all sections fully.

Business Name_____ Telephone_____

Address_____

City_____ State/Prov_____ Country_____

Web Site(URL)_____

Business Type: ☐ Sole Proprietorship ☐ Partnership ☐ Corporation

Incorporated in the state/country of_____

How many years in business under the name listed above?_____ Annual revenue last year:_____

What is your rating (if known) by Dun & Bradstreet:_____

Federal ID#:_____ If tax exempt, please attach completed resale certificate.

Amount of credit requested (in U.S. Dollars):_____

CONTACTS

ACCOUNTS PAYABLE:

_____ _____ _____
Name/Title Phone Email

Corporate Officer / Senior Manager:

_____ _____ _____
Name/Title Phone Email

BANK / TRADE REFERENCE INFORMATION

Bank:_____ Tel#_____

Full Address:_____

Account#_____ Bank Contact Name _____

TRADE CREDIT REFERENCES (PLEASE SUPPLY FULL NAME & COMPLETE ADDRESS)

	Company Name	Contact	Address	Phone
1)				
2)				
3)				

We hereby authorize the above listed credit references to release information to Masterclock, Inc. for use in the evaluation of this request. On behalf of the applicant, the undersigned hereby warrants that the above information be true, correct and complete. All sales are subject to the Masterclock terms & conditions on file at Masterclock offices and available to all applicants. Note that Masterclock will automatically add sales tax to shipments sent to Missouri addresses or companies incorporated in Missouri.

I hereby certify that I am authorized to sigh and submit this application for and on behalf of the company named above.

Signature_____

Name_____ -Title _____ Date _____
(please print)

For *Masterclock,* Inc. *Corporate office use* only

Date Received_____
References Checked/Credit Report Run By:_____ Credit Approved/ Denied by:_____ Credit Limit:_____
Notes _____

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